THE MODEL ENGINEER

Vol. 94 No. 2351 THURSDAY MAY 30 1946 6d

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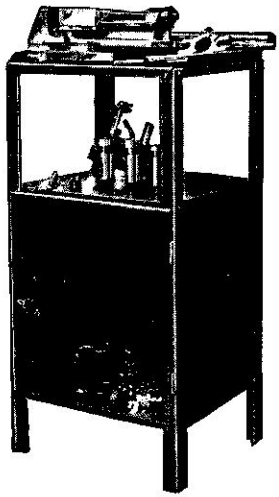

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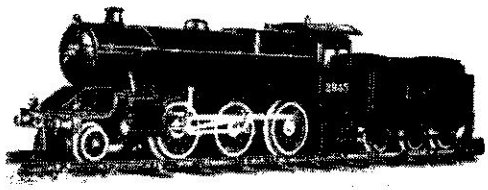

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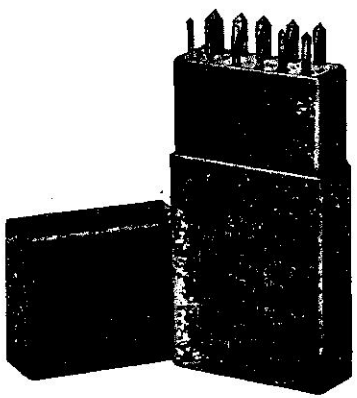

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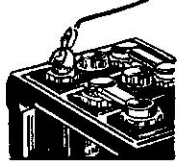

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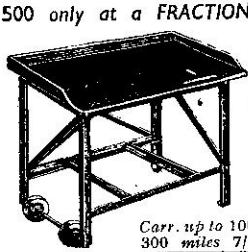

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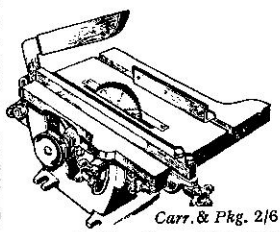

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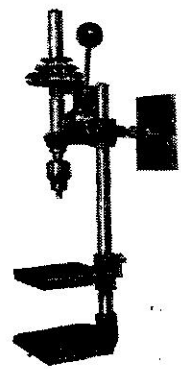

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THE

MODEL ENGINEER

Percival Marshall & Co. Ltd., 23, Great Queen Street, London, W.C.2
VOL. 94. No. 2351. MAY 30th, 1946

More Exhibition Prizes

TWO very nice additions to our Exhibition prize list have recently been forthcoming. The first of these is from Mr. A. Groves, of Watford, who won the locomotive championship cup in 1926, for a beautiful large-scale model of an L.S.W.R. engine, which has since been honoured with a place in the Science Museum. Mr. Groves now kindly offers to return his cup as a trophy for the best locomotive or steam engine model in 1946. The winner will therefore have the distinction of receiving a championship cup from the home of a champion with whom it has been a treasured possession for twenty years. Mr. S. A. Walter, of Wembley, generously offers encouragement to "out of the groove" model makers. He is putting up a cup for the best "unusual" model, by which he means unusual in the sense of selection of subject, combining good craftsmanship with originality in the choice of a prototype. Interest in our competition section is growing rapidly, so do not delay in securing your entry form.

Society Heroes

ONLY those who have undertaken the organisation of a local exhibition can appreciate the self-sacrifice of time and energy devoted to the cause by chairmen, secretaries, and committee men. Their reward lies mainly in the pleasure given to the public and in the uplift which the occasion gives to their own Society and to the cause of model engineering. I often get a little "back stage" information on these matters from secretaries who send me reports of their efforts, but while many of them refer to the very strenuous nature of their duties they nearly all say the show was well worth while, and they are looking forward to a repetition next year. Here is a recent example of heroic effort. I do not mention any name because the story is told as a simple record of fact and not in any boastful spirit. To begin with, my correspondent relates that he was entrusted with the preparation and production of posters, press advertising, the exhibition catalogue, and photographs. The show week co-incided with his annual holiday, so he was busy at the hall from Tuesday morning till Sunday dinner time, with, as he quite casually mentions, intervals for eating and sleeping. He drove five different locomotives on the passenger track, with a five-hour spell on one occasion, and took turns in controlling hundreds of waiting passengers while others were driving. Between while he answered hundreds of questions, made new friends, re-made the acquaintance of old ones, and acquired quite a lot of knowledge. He sums up by saying: "Taking it all round I had a very good time, and am already looking forward to next year."

A Salisbury Revival

I AM glad to hear that the Salisbury Society, after a period of war-time quietude, is resuming its activities again. In its workshop in South Western Road the Society has a good equipment of tools, including four lathes, available for use by its members. Mr. R. A. Read, the former secretary, has now returned from service with the Forces, and is relieving Mr. E. J. Stacey, who has been doing duty meanwhile. The workshop facilities are to be improved, and it is hoped that the model aircraft section will soon be able to resume its flying meetings and competitive events. The Chairman, Mr. G. D. Lovell, is keenly interested in the revival of the Society, and will be pleased to welcome new members at any of the meetings. The address of the Honorary Secretary is 89, Roman Road, Salisbury.

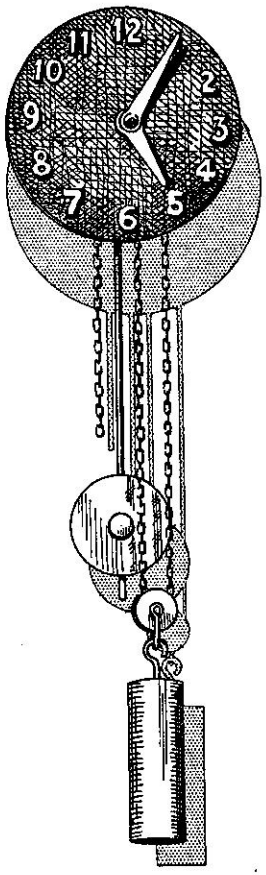
Power Boating at Tynemouth

A POWER boat programme of pre-war vintage has been arranged for this summer by the Tynemouth Model Yacht Club. No less than 10 cups and one medal are to be competed for at the regular meetings, and on July 20th the North East Coast Championship Day will be held. On this occasion the Club will have the use of the lake until the late evening. Five of the meetings are to be devoted to steering competitions, one to a prototype event, and one to hydroplanes. The sailing members have four dates allotted to them. The secretarial duties have now been taken over by Mr. S. H. Walker, 18, King Edward Road, Tynemouth, in succession to Mr. T. R. Barnett, who has done so much good work for the Club in the past. Mr. Walker is the owner of the fine model battle cruiser *Monarch*.

Percival Marshall

A BRACKET CLOCK

By R.B.F.



WE were together one evening when he said to me :— "I want an idea for something to make," then, after a pause, "It's got to be simple for several reasons; one, my stock of material is getting very low ; two, I haven't much time, so each piece would have to be machined during the short spells I am able to spare in my workshop, and finished, if possible, with the tools I can take with me when on A.R.P. duty at night ; and lastly, I don't want it to hang on for a long time unfinished."

I did not reply immediately, but set the grey matter working, and then suggested.

"Why not make a simple clock? It seems to fill all your requirements." Then I facetiously added, "Its tick would keep you awake when in your workshop."

He gave me a dirty look and said : "Yes, not bad ; but I've got no particulars, and I'm far too lazy to worry them out for myself."

"You should be ashamed of yourself," I replied ; "half the fun is in the worrying out, but as you are so lazy perhaps you would look round at my place tomorrow evening and I will see what can be done. Or perhaps you'd like me to make it for you ? "

The upshot of it all was, the clock was duly made about two years ago ; it proved quite successful, and may, therefore, be of interest to others. I am going to pass it on with the one stipulation that should a brother horologist chance to see it I crave his indulgence, as I dread to think of what his criticism might be.

The drawings are almost self explanatory. Fig. 1 shows the general idea, and should be referred to when finally assembling ; but to obviate any misunderstanding, we will take the making of the various parts in turn ; they had better be considered in groups, commencing with the spindles.

Fig. 2 is the main or centre spindle. Cut off a piece of $\frac{1}{2}$-in. diameter mild-steel $2\frac{7}{16}$ in. long ; mount in four-jaw chuck and set to run dead true with the indicator ; turn and screw the left-hand end up to the $\frac{1}{2}$-in. shoulder ; the square can be filed to size, using the division plate and file rest, or an end-mill can be mounted in the drill spindle and the sides of the square milled.

Polish the pivot and turn end for end in the chuck, set to run true and finish the other end. All pivots should be polished, as it reduces friction and prolongs wear much better ; the following is a method shown me by an old clockmaker and is very successful.

When the pivots have been turned to size, file out any tool-marks with a very fine file, then follow up with a soft-steel burnisher. This is a piece of flat mild-steel about $\frac{5}{16}$ in. wide, $\frac{1}{8}$ in. thick and 6 to 8 inches long ; it should have the edges slightly bevelled back to allow a sharp edge to go right up to a shoulder. The face should be slightly roughed with emery-cloth to give a key for the polishing medium.

For smoothing, use oilstone dust mixed with oil to a stiff paste, smear this on the polisher and with a filing motion polish the pivot until there is no cut left. When the pivot is perfectly smooth, thoroughly clean it from all traces of oilstone medium and dust ; a single speck of dust is fatal to the next process. Now mix the polishing medium, which consists of polishing rouge and thin oil ; charge the polisher as before and polish until there is nothing left ; then finally finish with an oiled burnisher ; the result will be a hard and highly polished surface.

It is not necessary to go to so much trouble with a clock of this kind, but the better the pivots are, the better the clock will work.

Figs. 3 and 4 give details of the second wheel spindle and the 'scape wheel spindle. These can be made of either mild-steel or silver-steel. Put a piece of $\frac{1}{8}$-in. rod in the chuck to project about $1\frac{3}{4}$ in., set to run dead true, centre end, steady with back centre and rough-cut thread for the whole length, finish with $\frac{1}{8}$-in. Whit. die. It is important that the threads on these spindles are quite true, that is the reason for suggesting that they shall be rough cut before running the die down. Turn the threads away as shown, then turn and polish the pivots, cut off centred end and part from bar, finish ends with a file and emery stick.

Fig. 5 is the spindle on which the pallet and pendulum crutch are mounted. At each end is the pivot, and $\frac{13}{16}$ in. from one shoulder file a dovetail slot to half the diameter of the spindle and wide enough for the pallet to fit tightly in the slot.

Having finished the spindles, take the wheels in hand. It is best to make these by completing each operation on all in turn. First prepare the blanks by roughly cutting from sheet brass one disc $2\frac{3}{8}$ in. diameter, 3/32 in. thick, for the main wheel, Fig. 6. One $\frac{11}{16}$ in. diameter, and 3/32 in. thick for click-wheel, Fig. 7. Two

2 1/16 in. diameter and 3/32 in. thick for sprocket shrouds, Fig. 9. One 1 5/8 in. diameter and 1/16 in. thick for second wheel, Fig. 15. One 1 5/16 in. diameter and 1/16 in. thick for 'scape wheel, Fig. 16. Two 11/16 in. diameter and 1/16 in. thick for minute cannon wheel, Fig. 21, and intermediate hour wheel, Fig. 23. One 1 3/16 in. diameter and 1/16 in. thick for hour cannon wheel, Fig. 24, and one disc of mild-steel, 1 1/8 in. diameter by 1/16 in. thick, for chain-sprocket, Fig. 8.

Drill a 5/16-in. hole in the centre of each of these discs. Mount a long 5/16-in. bolt to run true in the chuck and then lock each disc in turn on this between two nuts and washers, and turn to the outside diameters given. The outside diameters of the toothed wheels are calculated from Brown & Sharpe formula as follows: number of teeth, plus two, divided by diametral pitch, gives the outside diameter; and the pitch circle diameter is calculated by dividing the number of teeth by the diametral pitch. These

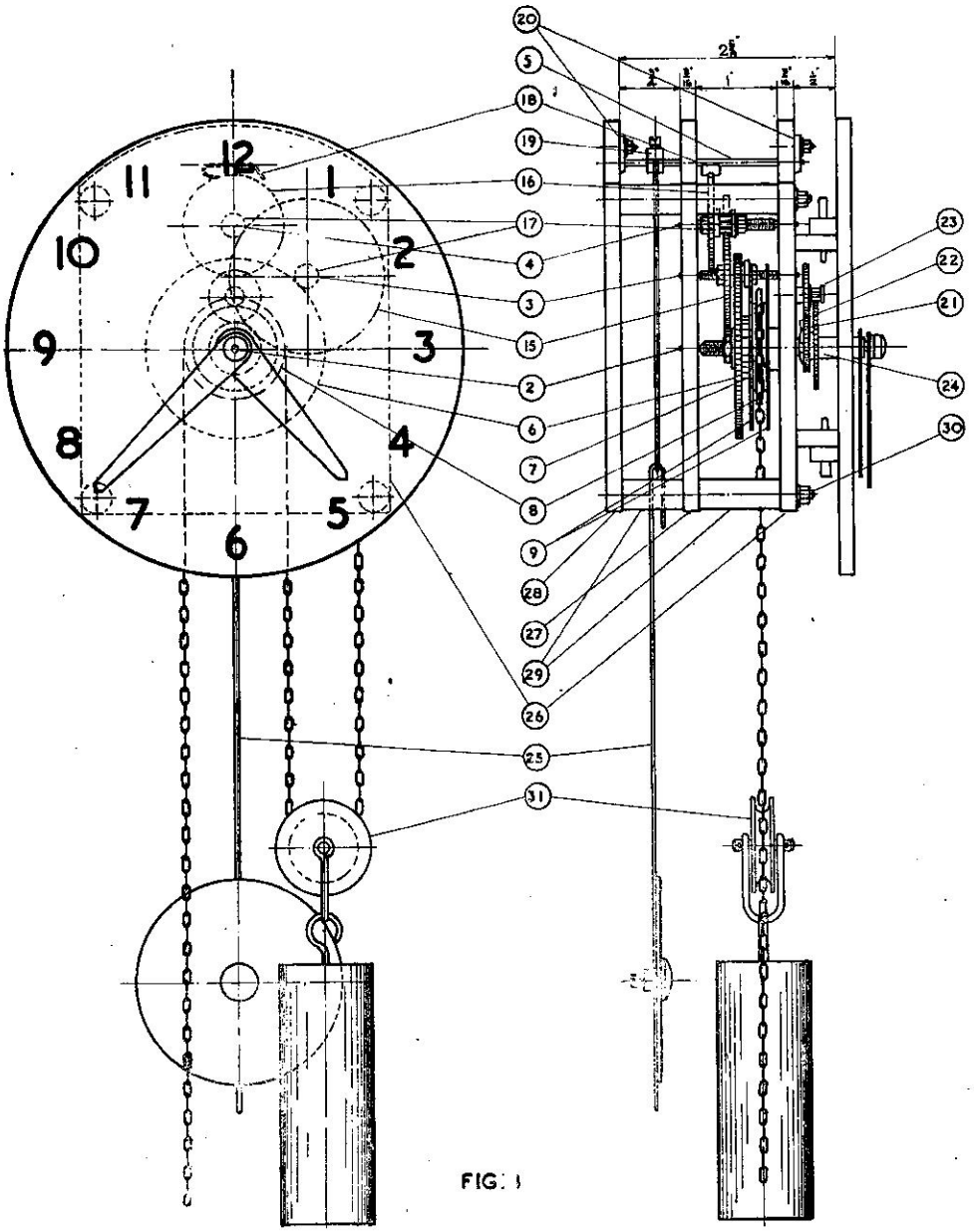


FIG. 1

formulae are given in case it is desired to cut wheels of a different pitch than those given.

When all the blanks have been turned, set up the gear-cutting head and cut the teeth to the particulars given on the drawings. In the case of the click wheel, Fig. 7, a 90 deg. or 60 deg. cutter can be used. The 'scape wheel, Fig. 16, wants

Now mount the sprocket shrouds, Fig. 9, on the bolt and finish turning; when this has been done, mount the two shrouds with the sprocket between on the bolt, and with a No. 43 drill in the drill spindle, drill four holes right through, equally spaced on a $\frac{13}{16}$-in. diameter pitch circle.

To complete the parts for the chain sprocket,

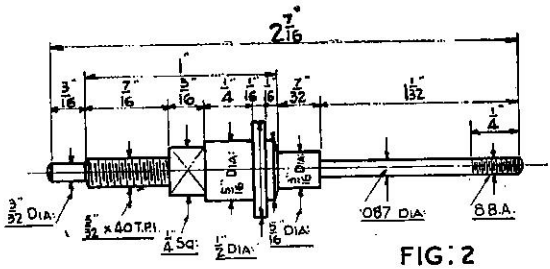


FIG. 2

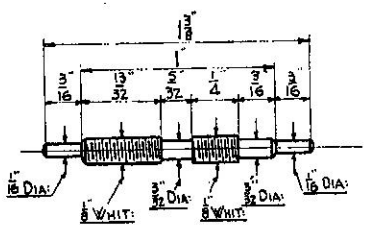


FIG. 3

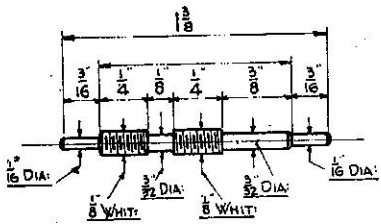


FIG. 4

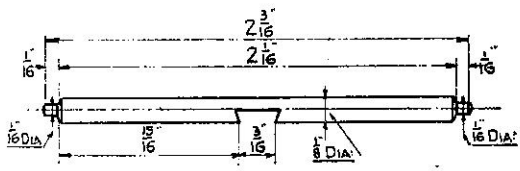


FIG. 5

slightly different treatment; in this case, use a thin slitting-saw instead of a gear-cutter, set this with its bottom face at centre-height and cut 30 slots $\frac{1}{8}$ in. deep; then raise the cutter so that the bottom face is $\frac{5}{8}$ in. above centre-height, and cut deep enough for the material between the teeth to fall away. Care should be taken to leave a very slight "land" on the top of each tooth. Use as much care as possible with the 'scape wheel, a good wheel makes all the difference between a good and bad timekeeper.

Having finished with the gear-cutting fixture, replace this with the drilling-spindle and mount the chain sprocket, Fig. 8, on the bolt, which should not have been removed from the chuck; scribe a circle 1 5/32 in. in diameter, put a centre drill in the drill-chuck and, using 110 divisions on the division-plate, centre a hole on the scribed line; then count four divisions and centre again; then count seven divisions and centre another hole. Repeat this in fours and sevens until twenty holes have been centred; now, using a $\frac{1}{8}$-in. drill, repeat the counting and drill the holes right through the blank. Remove the blank from the lathe and, with a fine saw and files, finish off the sprocket teeth; point each tooth from the sides to form a lead for the chain.

It should be borne in mind that the sprocket as shown will only suit a chain of about sixty links per foot and, of course, must have its teeth spaced to suit any other pitch of chain; the pitch of the sprocket-teeth will be the pitch of every two links of the chain and should be measured on the pitch circle.

make one special pin, Fig. 12, on which the click is mounted; two, as Fig. 13, for the click spring and one screw, Fig. 14, and the click, Fig. 10, all from mild-steel. The click spring, Fig. 11, is made from spring-steel wire.

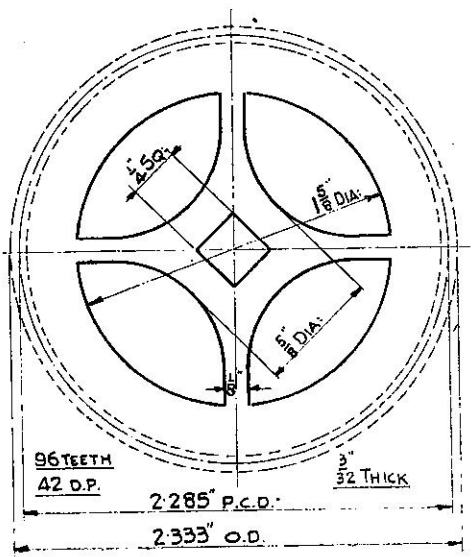


FIG. 6

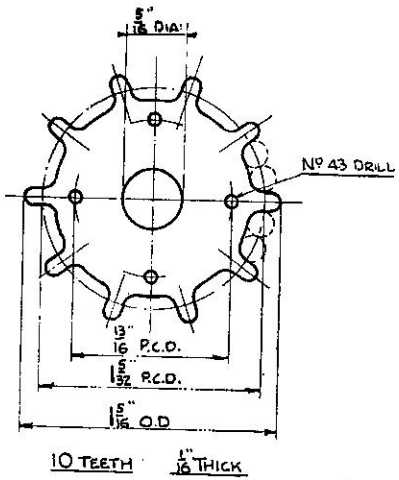


FIG. 8

To assemble the chain-sprocket, insert the screw, Fig. 14, having first countersunk one of the holes in one of the shrouds so that the head lies flush; lock the screw with an 8-BA nut. In the next hole to the right, when looking from the front of the clock, fit special pin, Fig. 12, which retains the click, Fig. 10; lock this also with an 8-BA nut. Bear in mind that the sprocket has to revolve in an anti-clockwise direction when free. The two pins, Fig. 13, are fitted in the two remaining holes and hold the spring which must bear with fair pressure on the back of the click; lock these pins with 8-BA nuts.

The wheels can now have the spokes cut out and be generally finished off; the centre holes will require boring to the sizes given. To hold the wheels accurately and, at the same time, cause no damage to the teeth, mount a piece of soft wood in the chuck or on the faceplate; the wood must be somewhat bigger than the largest wheel. Take a facing cut across the face of the wood and, with a sharp knife-tool, turn a recess just deep enough to take the smallest wheel, the diameter to be just enough to ensure that the wheel can be pressed into the recess so that the teeth hold it from revolving. When the smallest is finished, turn the recess bigger for the next size of wheel, and so on until all have been finished.

The main wheel, Fig. 6, and the click-wheel, Fig. 7, should be bored out to ¼ in. diameter, then both must have the bore filed out square to fit the squared part of centre spindle, Fig. 2, exactly.

The chain-wheel assembly should be bored to run freely on the same spindle. The second wheel, Fig. 15, and the 'scape wheel, Fig. 16, require boring a force-fit on their respective pinions. The minute and hour cannon-wheels will be bored to be a press-fit on their respective cannons.

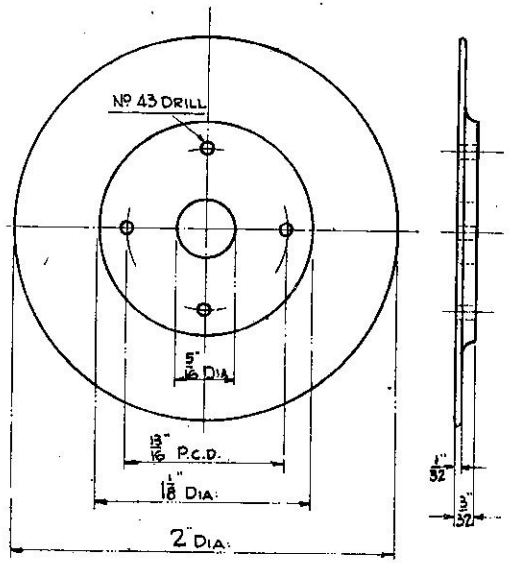


FIG. 9

This brings us to the lantern pinions, Fig. 17 and Fig. 23, and here the worst criticism will be levelled at me, I expect, as it is usual to press the shrouds of these pinions on the spindle; in this case, however, it will be found that they are screwed. I offer no excuse for this except that it allows easy adjustment and was specially requested by my friend, as he has a strong dislike to fitting anything that cannot be undone!

(To be continued)

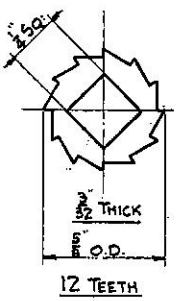


FIG. 7

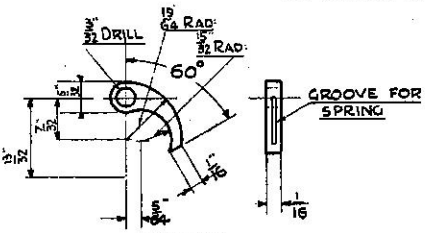


FIG. 10

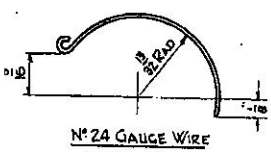


FIG. 11

"CARVING OUT" A TWO-STROKE ENGINE

by Edgar T. Westbury

THE component of the "Zephyr" engine which involves the most detail work is the body, comprising the outer casing of the cylinder and the crankcase body; it is, therefore, advisable to tackle the machining of this part first. Both ends of the 1¼-in. bar should first be faced up, but not necessarily finished to dead length; and should the diameter be greater than that called for, it may be turned smooth and parallel over the outside, if not to this dimension, at least to a definite oversize dimension which will enable measurements to be taken from the outside surface.

The centre line for the crankcase barrel should first be scribed right round at 19/32 in. from the end of the bar (plus whatever allowance has been left for trimming), and the bar is then set up across the jaws of the four-jaw chuck, with this mark on the centre-line. It will probably be found necessary to reverse one of the chuck jaws (unless the chuck is a pretty large one) to accommodate the offset length of the upper part of the body. Care should be taken to keep the bar parallel with the face of the chuck, and the two side jaws should be adjusted to centre the bar sideways, as may be checked by means of a depth gauge from the outside edge of the chuck body.

First take a facing cut on the portion of the bar in the vicinity of the working centre; at this stage, it is only necessary to face the crankcase barrel diameter, but it is quite safe to go out to a radius of 1 3/16 in., as the metal will eventually have to be removed, and it can be done as well now as later on. The cut should be taken back to a distance of 7/32 in. from the front surface of the bar.

Next centre the crankcase, and drill through to any convenient size, opening out with a boring tool to the core size of the thread, which is 0.822 in. If the tool is shaped correctly, it may also be used for the recessing (or "chambering") operation, which consists of opening out the centre part of the barrel to ⅞ in. diameter for a width of ½ in.; but if not, an internal recessing tool should be used. At the same time, the rear end of the hole may also be recessed out, beyond the width of the body, leaving a clearance for the screwcutting tool, so as to avoid an unnecessary amount of work for the latter. It will be possible to measure the recessed portions with ordinary inside callipers, by entering them at an angle; but the dimension is not critical, and measurement from the index of the cross-slide will be quite in order; any error should be on the full side for preference.

The screwcutting operation is quite straightforward, and should present no terrors, even for the novice, if he is prepared to take reasonable care. To cut 24 t.p.i. on the usual model engineer's lathe, which has an 8 t.p.i. lead screw, a 20-toothed wheel is put on the mandrel, and a 60-toothed wheel on the lead screw, with any wheel (or wheels) as intermediate or "idlers." The thread will "pick up" anywhere, but the cautious turner may find it just as convenient to keep the clutch engaged and turn the lathe backwards—after running back the cross-slide—each time, to restore the tool to the starting position. It is very little advantage to run the lathe under power for small operations of this nature. If the recessed part has been bored to exactly ⅞ in. diameter, the screwcutting operation should be continued until the point of the tool just scratches this surface. To finish the thread, several runs should be taken without applying extra feed, as there is always an appreciable amount of spring in an internal screwcutting tool. A chaser should be used for final finishing, if available, but should not take out any more than is necessary to remove the burrs from the tops of the threads.

Remove the work from the chuck, and make a screwed mandrel, on which to mount it for facing the other side of the crankcase barrel. It is a good policy to make the mandrel to run between centres, or otherwise capable of being replaced in true-running condition whenever desired, as it may come in handy later on; it is also useful as a gauge, to check the diameter of the screwed components which are to be fitted to the crankcase. The facing of the crankcase should be symmetrical on the two sides, so that the barrel lies exactly in the centre of the bar, but any errors which may be made in this respect may be compensated for when making other components, providing that they are known and recorded.

It is now necessary to machine the upper part of the body, and for this operation, there is no better method than clamping the work to an angle-plate mounted on the faceplate. I have described operations of this nature on several occasions, so it should not be necessary to illustrate the set-up, which is quite a common one in workshop practice. A central bolt through the crankcase barrel may be used for clamping, and the machined surfaces should be protected by thin paper washers, interposed between them and the angle-plate, also the clamping-plate.

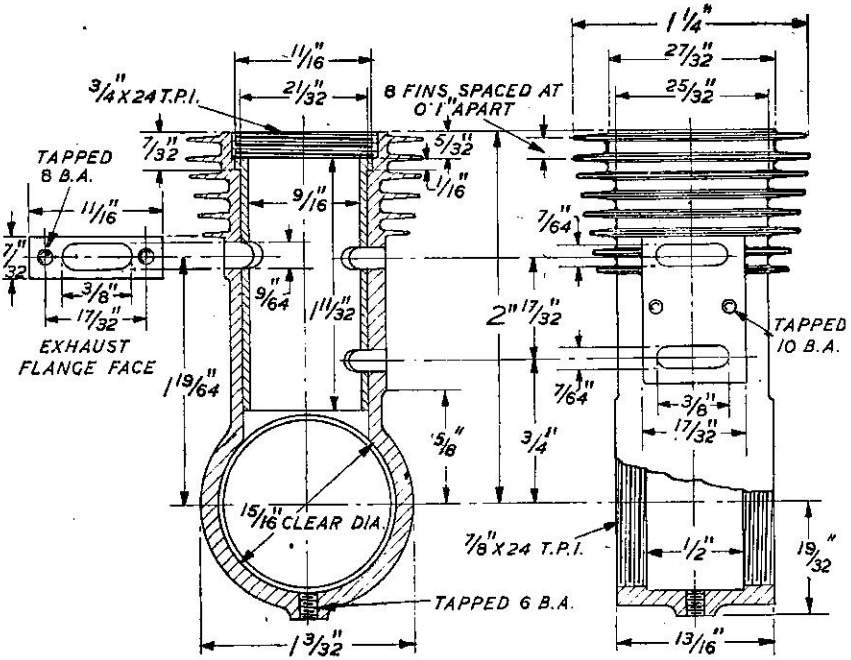
Before attempting to set up the assembly in the lathe, the squareness of the sides of the bar with the surface of the faceplate should be checked, by applying a square to both sides in

* *Continued from page* 485, "*M.E.*," *May* 16, 1946.

turn, and when this has been assured, the bolt securing the work to the angle-plate should be fully tightened, and not afterwards interfered with. Now set the bar to run truly, by shifting the angle-plate on the faceplate; the use of a test indicator, such as the "Unique" (which is still a very modestly-priced appliance), will very much facilitate this operation. Balance the angle-plate with a suitable piece of metal attached to the faceplate, so that it can be run at high speed without vibration.

It is immaterial whether the internal or external turning is done first, but I find it most convenient to begin by putting a centre in the end, and using the tailstock to support the work while turning the finned portion, before boring the inside. The exact spacing of the fins is not of vital importance, but it is best to locate them with reference to the cylinder ports, which, in turn, are located from the centre line of the crankcase, as shown in the drawing; so it is a good plan to scribe the port positions on the bar before proceeding further. It will be seen that the fins are tapered to provide maximum cooling efficiency, and although this is not of the highest importance in an engine which will have an airscrew to provide ample cooling blast, it is little more trouble than the crude and inefficient parallel fins commonly provided on commercial engines, just because they are a little easier to machine. I generally gash in the fins with a narrow parting-tool, almost to full depth, and then finish with a narrow tool tapered to an included angle of 5 deg., with a rounded nose to form the slight radius at the root of each fin. By the way, this tool, which I made over ten years ago, has done duty on some hundreds of engines, and is still good for quite a few more.

The finning is tapered down towards the lower end of the cylinder, the precise shape being a matter of appearance, and determinable better by eye than by measurement. Note that the two lower fins cannot be machined by straight turning, and must be left for the present, but their location can be marked out for future reference by shallow cuts. The only part of the cylinder skirt which can be turned is a narrow ring, below the transfer cover face, which terminates $\frac{5}{8}$ in. above the crankcase centre; this part can be machined, to a diameter of 25/32 in., for a width of about $\frac{3}{16}$ in., and forms a "witness" for subsequent shaping operations on the cylinder skirt.



Body of "Zephyr" 2½-c.c. engine (full size)

The boring operation may now be carried out, care being taken to produce a smooth and parallel bore; a reamer may be used, providing that it has only a short "lead," and that it is not expected to take out more than one or two thousandths of an inch. In screwcutting the upper end of the bore, it should first be counterbored to 0.697 in. diameter for a depth of 7/32 in., and it is best to avoid under-cutting the end of the recess to provide clearance, as this may weaken the wall at the point where maximum strength is required. In other respects, the same procedure as for cutting the thread in the crankcase barrel may be adopted. A true and dead-smooth surface should be left on the top face of the body.

Cylinder Liner

The material used for the liner should either be fine-grained cast-iron stick, or a hard-wearing alloy steel. I regard mild-steel, especially in the form of drawn tube, as unsuitable for cylinder bores, if one expects to get reasonably good wear from them. My views on this matter have been repeated many times, but I still find many constructors using unsuitable material for cylinders. Cast-iron, in so light a section, has the disadvantage of being extremely fragile, but it is the best-wearing material I know, unless one is prepared to indulge in hardening processes, which are generally outside the scope of the amateur. The liner should be finished as accurately as possible, both inside and out, at one setting, and should on no account be too tight a fit. Constructors often fit liners so tightly that they are crushed and distorted all out of shape in inserting them in the bore. In an engine of this size, the amount of interference required is hardly measurable—certainly not more than one or two "tenths"—and it is best to fit them practically by "feel." The lower end of the liner, below the exhaust and main transfer ports, may be relieved, or eased off, so that it slides in easily, and the rest of the length should be a fairly tight "wringing" fit. If the liner is turned from a length of material held in the chuck, it may be tried for fit before parting off, and the judicious use of a dead-smooth file will help fitting, so long as it is only used to remove the last trace of metal.

After parting off, the liner should be carefully faced on the rim, the outer diameter of which should just pass clear of the threads in the body, and it is then inserted in place, after coating the outside with thin shellac varnish or jointing compound, which acts as a lubricant, but subsequently dries off and seals any minute chinks between the liner and the casing wall. The lapping of the cylinder bore, and the cutting of the ports, are carried out after the liner is inserted.

This completes the straightforward machining on the body, and the further operations consist of shaping and "finaigling" to remove unwanted material from the cylinder skirt and crankcase barrel, the description of which will be dealt with next time.

Trade Corner

I have had some correspondence lately with Mr. S. A. Smith, of 65, Blenheim Avenue, Chatham, a pre-war petrol engine enthusiast who has recently been demobilised from the R.A.F., and is now starting in business, manufacturing and repairing model petrol engines and accessories. The many readers who have written to me in the past, enquiring where they can get engines overhauled or repaired, or components machined, will welcome the news that Mr. Smith is prepared to undertake work of this nature. I have examined engines and components which he has produced, and am much impressed with their quality; but I add the usual caution that, beyond this, I have no interest in his business, and undertake no responsibility connected therewith.

It may be of interest to mention that Mr. Smith was shot down over Germany, and spent several months in a German prison camp, during which he succeeded in constructing model aircraft with the most incongruous materials, and practically nothing in the way of tools or equipment. When eventually liberated, minus a leg, a few days before VE-day, he decided to turn to his favourite hobby as a means of making a living, and I feel sure that readers will join with me in wishing him every success in this venture.

Apologies are due to readers for a somewhat misleading statement on page 463 of the May 9th issue, under the heading "Ignition Drawings and Supplies," where I referred to the coils and special magnets for the "Atomag Minor" which are being put on the market by Messrs. G. Hastings, of Worcester. Some readers may have formed the impression that these are ready for delivery, but unfortunately in this, as in many other matters connected with model engineering supplies, there have been unexpected delays in the supply of raw material, and the indulgence of customers is requested in cases where orders cannot be fulfilled immediately.

I have received many complaints from readers about delays in the delivery of goods ordered from advertisers, but in most cases which I have investigated, there is no question of dishonesty or inefficiency on the part of the firms concerned, but simply an echo of the supply difficulties which are prevalent in every industry and business at present, and which, we hope, will straighten itself out in due course.

The castings for the Atom Minor 6 c.c. engine as supplied by the Headingley Motor and Engineering Co. Ltd., Leeds, have now been improved in detail, and are supplied with a sand-blasted finish. Piston rings are now available for this engine, and the firm concerned strongly recommend the fitting of rings in preference to relying entirely on the close fit of the piston. I agree that really well-fitted piston rings improve the running of an engine, especially when it is no longer in its first youth.

Reviews of Commercial Engines

A number of correspondents have asked for more descriptions of ready-made engines, the number and diversity of which are found a little bewildering, especially as very few of these engines are available for inspection. In one case it is suggested that a table listing the various makes of engines, with essential data in respect of bore, stroke, capacity, and other salient features, should be published. I agree that this would be extremely useful to prospective buyers, and am quite prepared to publish such a table, if the makers of engines will furnish me with the necessary data; but I am sorry to say that most of them are, up to the present, singularly uncommunicative, and I am as much in the dark about the details of the design and construction of many of the engines as any of my querists.

(*To be continued*)

*A 4-IN. LATHE & ITS EQUIPMENT

BY K. N. HARRIS

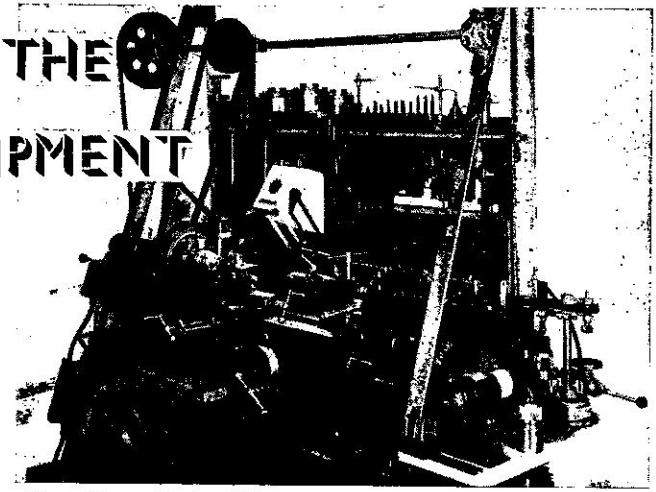


Photo No. 3. Lathe with 8 mm. collet and drawbar in place and protector on mandrel nose. Note "Pluslite;" this was switched on when picture was taken

THE bench top is of oak with a pair of fitted drawers below and a backboard and shelves at the rear. The countershaft is mounted on two "Skefko" self-aligning plummer-blocks bolted to the faces of the main angles of the "A" frames. Owing to the exigencies of supply, I had to use ¾-in. plummer-blocks and shaft, amply strong from a purely power-transmission viewpoint, but insufficiently rigid to take belt-pull without undue whip, unless the pulley is close to a bearing. This is a plain g.m. block with a lubricator, supported on a vertical channel-brass column and bracketed at the top by a triangular plate to the back-board structure, to steady it sideways. The S.K.F. bearings and this stay bearing are all adjustable for height for belt-tensioning purposes.

The motor is mounted on a hinged plate behind the headstock and drives by means of a Whittle belt to the countershaft. There is a two-step pulley on the motor and a corresponding one on the countershaft. These, in conjunction with the 3-step lathe cone and back-gear, give a range of 12 speeds. A third pair of pulleys will be added later, to give a higher speed for very small work.

The motor is a 1/3 h.p. 240-volts 50-cycle single-phase capacitor-start type running at 1,425 r.p.m. As already stated, it is mounted on a hinged plate. Beneath this plate at the edge remote from the hinge is pivoted a lever about 12 in. long with a short toe-piece or cam about 1 in. long, at 90 deg. to it. When the lever is horizontal the cam or toe is vertical, lifts the hinged plate and allows the motor pulley to run free of the belt; when the lever is raised to the vertical it allows the hinged plate to swing down, the weight of the motor comes on the belt and the drive takes up. This sounds crude, but it is very simple and works excellently; furthermore, it saves constant switching on and off of the motor. The main switch is mounted on the front of the L.H. frame below bench level, whilst above it is a reversing switch, giving "forward," "stop" and "backward." This, too, is a great convenience and time-saver.

In addition, a simple brake is hooked up to the lever by a weighted rod so that when the lever is horizontal the weighted rod applies a bandbrake to a flat pulley on the countershaft; but when the lever is vertical, the brake is *positively* lifted off the pulley. Again crude, but most effective and quite a time-saver on small jobs requiring high speeds and changes of operation and setting. This is not shown in the pictures.

Drive from countershaft to lathe is by a fairly heavy 1 in. wide flat belt, which received a very thorough dosing of castor oil and was well stretched before being installed.

A metal tray is fixed in ⌐¬ clips fastened to the bench top, and forms a removable front extension to it. It can be removed entirely and slid out of the way under the lathe.

On the bracket steadying the vertical bearing stay, previously referred to, can be mounted a large tin holding about 1 gallon and having a screw-down needle-valve and a universally-jointed pipe for lubricant. The pipe carries a plain plug-cock near its business end, so that it can be turned on or off as required, the needle-valve being used to regulate the flow. A cover is provided for the container to keep out dust.

The shelves at the back house most of the day-to-day equipment; in one corner, for instance, each in its own clip, is a complete set of spanners for every nut, including round-slotted nuts, on the lathe. Chuck-keys are on pegs down the centre partition; centre drills in one block of wood; centres and a quick-acting "Marvel" drill-chuck in another; a large assortment of ⅜-in. round-shank cutting-tools which fit more than one tool-holder, in still another. The normal cutting-tools are mounted in a sloping partitioned rack with their business-ends facing the operator. This is both handy and enables one to see at a glance if any are "not at home." Beneath this are a variety of boring-bars and tool-holders, knurling-tools, etc., and adjacent

* *Continued from page 504, "M.E.," May 23, 1946.*

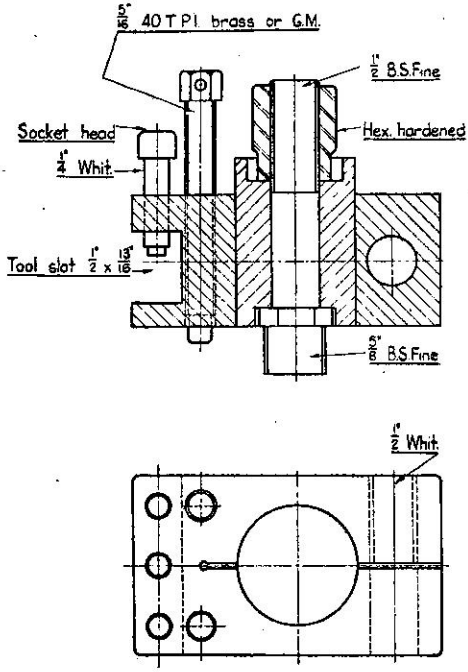


Fig. 8. Special tool-post and holder. (1 *off.*) *Main block of mild-steel*

thereto is a gauge for setting tools to centre-height. Spare tool-posts and the hand-rest are stored on an upper shelf. Hung at the end of the shelves are two whisk brushes, one medium and one small, together with a toothbrush and a bottle-brush, all very useful for clearing chips and cuttings. Chucks are kept in the drawers below the lathe; change-wheels are, at the moment, carried on a spigot stand; but a cabinet is being made to build into the main stand to house them in shallow drawers, each on its own peg, numbered to suit the number of teeth. In the lower part of the same cabinet will be a cupboard to hold such items as vertical slide and accessories, drilling-spindles, etc.

Local, as apart from general, lighting is provided by a "Pluslite," an invaluable fixture which, besides having an excellent adjustable shade which enables one to get the light exactly where it is wanted whilst keeping it out of the eyes, has a large magnifier some 3 in. × 4 in. attached to it, which is not only very useful for fine work, particularly fine screw-cutting, but acts as an excellent transparent chip guard!

The lathe centres, by the way, are 4 ft. 2 in. from the ground, a figure very much larger than normal. This is a purely personal idiosyncrasy of mine, as I like to be able to inspect the progress of a bored hole without having to contort my spine into the shape of a "C" spanner!

At the tail-stock end of the stand, two brackets carry an extension of the bench, and on this extension are mounted a direct-driven miniature tool-grinder and buff and a super-high-speed sensitive drilling machine (both by Runbaken) either of which can be plugged in to a feed-supply at the end of the bench.

The grinder is only suitable for touching-up tools, but, in conjunction with a couple of little carborundum slips (one round and one triangular), is invaluable for keeping tools in a first-class state.

Accessories and Fitments

The limit to these, of course, is only set by the owner's patience and longevity, and I have not reached it on either count yet It has been my experience in over forty years of engineering, nearly half of them spent in, or in the closest contact with, the "Shops," that it pays almost every time to make a tool or accessory to do a job, in many cases, even if it is only a "one-off." Nearly always you find, even in the latter case, fresh uses will crop up. I work on this assumption so far as I am able, and, apart from facilitating the production of decent, accurate work, get a lot of fun out of it. I know lots of people say that it takes too long; well, if you are building just one model on the "Mrs. Beeton" principle and are mainly interested in getting the job working with the minimum of expenditure of time and trouble, it probably does. On the other hand, if you make models not only because you are interested in the model as such, but take pleasure and pride in craftmanship as well, then it pays hand-over-fist, and pays handsome dividends in time saved too. I am moved to this digression by the first accessory I am describing, *an eccentric-turning device.*

This was made up specifically to turn two loco. outside crankpins of the type sometimes found (on the old G.N. "Atlantics" and on the "Claughtons," as examples) where the throw of the crankpin for the connecting-rod is greater than that for the coupling rod; in other words, the two diameters of the crankpin are eccentric to one another.

This device was made years ago for a little Lineker and Winfield 2¾-in. centre lathe, but has since been used on two others before graduating to

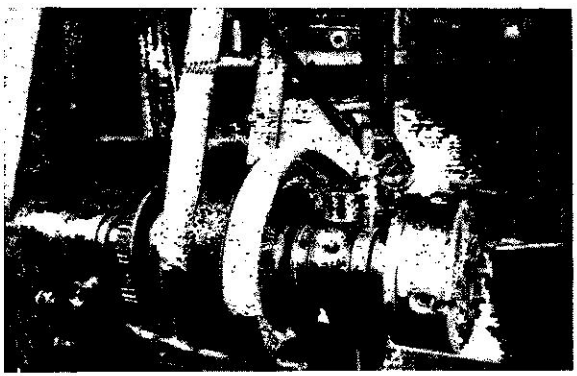


Photo No. 5. Close-up of headstock, showing micrometer stop for interpolating division work

the present machine. It is shown in photograph 8. It is fixed to the face-plate in such a manner that when the index is set at zero the bore and external diameter of the boss run true. A small face-plate and a small three-jaw self-centring chuck are available for use with it. It is adjustable up to about 1 in. eccentricity either way.

As I say, it was made for one special job which could have been done quite well with a much simpler set-up, but it has repaid the time and trouble spent on it many times over. It is always ready for use and can be set up at a moment's notice; incidentally, it can be, and sometimes has been, used on special facing, boring and recessing operations on work fixed on a saddle or vertical slide.

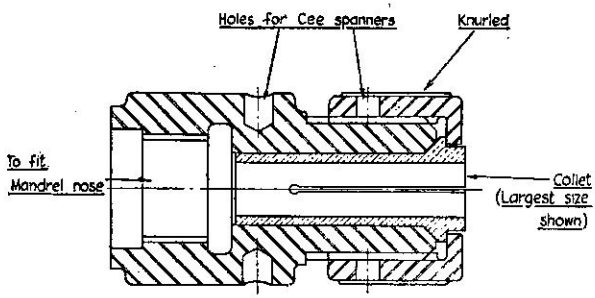


Fig. 9. Large collet adaptor

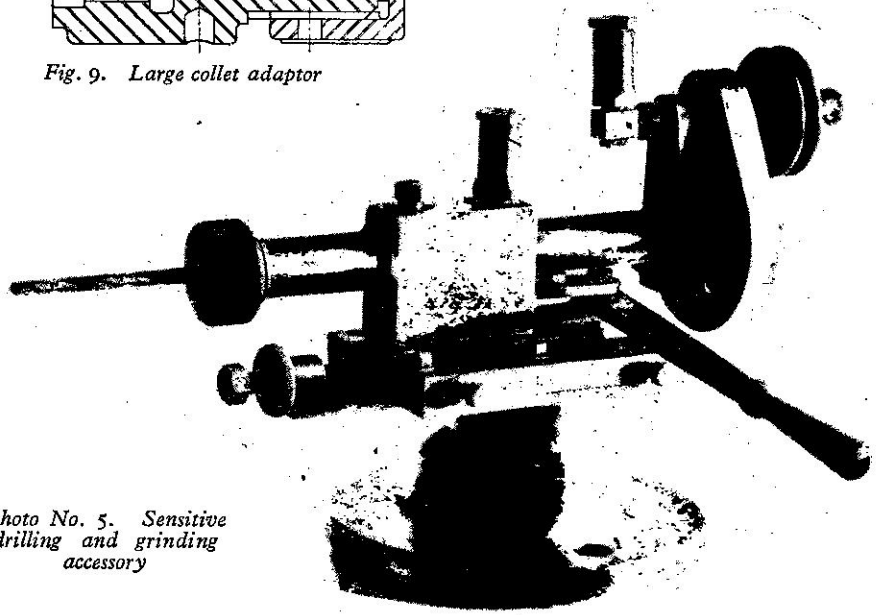


Photo No. 5. Sensitive drilling and grinding accessory

Boring Table

This was not part of the maker's outfit, but had been added by a previous owner. It is 4 in. × 5 in. and has two "Tee"-slots and two pairs of counter-bored holes, by either pair of which it is possible to bolt it to the swivel face of the cross-slide in varying positions. This method of fastening led me to add to it a spigot which fits the centre hole in the cross-slide and can be fitted centrally between either pair of holes in the table. By the aid of this, a job can be set-up and faced at right-angles, or cross-holes, machined accurately at one setting by swivelling the whole table.

Vertical Slide

This is a "Drummond," and, as those familiar with it will know, a robust and sturdy job. I have made two additions to it, namely a new double-ended bracket to carry it, such as was described many years ago in THE MODEL ENGINEER, I believe by Mr. Fred Horner, and an index to the vertical feed-screw. Available for use with it are :—

(*a*) A substantial foot bracket which converts the vertical sliding table into a full-sized L-bracket. This foot bracket has a number of tapped and plain holes for fastening work. (*b*) A small box angle-plate, 2 in. × 2½ in. scraped true and square on all faces. This, too, has plain and tapped holes in its sides. Actually it was made for my 2-in. Wolf-Jahn precision lathe, but is a very useful addition to its larger brother. (*c*) Two plain angle-plates, one medium and one small, true on inside and outside faces. (*d*) A Keats "Vee" angle-plate. (*e*) Drummond's standard dividing-spindle for gear-cutting. (*f*) A drilling and milling spindle which I made up specially. This is similar to the original "Pittler," and can be mounted direct on the cross-slide swivel by means of an adaptor base or upon the vertical slide. Its fastening is double-sided and graduated in degrees both sides, so that it can be mounted either hand about. Two sets of cone pulleys for round belt are available, one for high speed and the other for heavier work. The spindle is adapted for 8-mm. collets and has a hollow drawbar.

Sensitive Drilling, Milling and Grinding Attachment

This is an accessory I made up out of scrap in 1936 (and which earned a V.H.C. certificate at THE MODEL ENGINEER Exhibition that year, second prize in the tool section at the Kodak Exhibition in 1944, and a special prize at the Watford show the same year). This is illustrated in photographs 6 and 7, and is self-contained with its own lever feed. This can, however, be locked and the lathe-feeds utilised. The accessory mounts on the cross-slide swivel and has its base graduated. The spindle can be driven through the reduction gear, or this can be removed and the pulley mounted direct on the spindle. It takes the 8-mm. collets on a push-in basis. It is *not* intended for heavy work but only for light high-speed jobs.

Photo No. 6. Sensitive drilling and grinding accessory mounted on cross slide swivel base

Change-wheels

A set of 22 change-wheels, 18 D.P., was supplied with the lathe 20, 21, 22, 23, 24, 25, 30, 35, 40, 40, 45, and, by fives, to and including 100. I added six more (in steel), 105, 110, 115, 120, 125 and 127, the latter, of course, for metric threads.

Capstan Head for Tailstock

This is a standard commercial accessory and a very useful tool for repetition jobs, such as screws, studs, nuts, etc. It is mounted on a No. 1 M.T. shank and has six tool-stations.

Division Plate

In addition to the dividing of the main gear-wheel, a division-plate with 19 rows of holes varying from 360 to 109 can be mounted on an extension of the tail of the mandrel.

Large Collet Adaptor

A set of seven larger collets from $\frac{3}{16}$-in. to $\frac{9}{16}$-in. is available and an adaptor as detailed in Fig. 9 was made for them. The adaptor proper was, of course, bored in position on the lathe. As the mandrel is bored 17/32 in., it is possible to operate on long lengths of rod up to $\frac{1}{2}$-in. diameter.

Slotting Attachment

This is a very useful accessory for cutting internal keyways and general small slotting jobs, and consists of a short cross-slide carrying a clapper toolbox, the whole mounted on a No. 2 M.T. shank so that the axis of the slide intersects the axis of the shank. It fits into the barrel of the tail-stock lever-feed and is operated by it. It can be used quite satisfactorily to finish off the part-circular ends of connecting- and coupling-rods and similar jobs.

Boring Head

A "Creed" adjustable boring and facing head is available fitted with a No. 2 M.T. shank. This is a robust and versatile tool and capable of very fine adjustment.

Overhead Drive

This is by a separate motor of $\frac{1}{3}$-h.p. which is universally-mounted on a swing frame traversed longitudinally on its axle, which, in turn, is carried by brackets on the apex of the "A" frames. Tension is provided by a weight hanging from an arm extended to the rear of the axle, and a number of notches are provided in this arm so that the tension can be varied. The motor spindle is double-ended and is fitted with a 3-step "Vee" cone pulley at each end. The motor can be set with its axis parallel to that of the lathe, at right angles to it, or at any angle in between. As it can be turned through a complete circle the motor can drive in either direction in any position with an open belt. One advantage of this scheme is that it does away with a good deal of lost power absorbed by bearings, jockey pulleys, etc., and further, being quite independent of the main drive, one has a much freer hand for grinding operations where it is necessary for the lathe spindle to rotate as well as the grinding-spindle. The whole frame can, as already stated, be traversed along its main axle, which is $1\frac{1}{8}$ in. diameter B.D.S. The traversing is effected by a light steel cable led over jockey pulleys, at each end of the axle and connected to a small drum controlled by a hand-wheel. The two ends of the cable are fixed to opposite sides of the frame

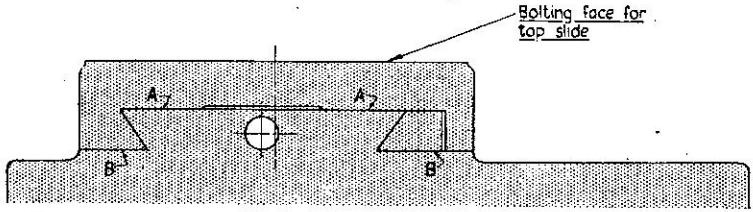


Fig. 10. End view of cross slide, showing bedding of surfaces

of the overhead gear ; consequently, rotation of the drum causes longitudinal movement of the frame. The hand-wheel is situated below the bench, accessible but out of the way of accidental disturbance. This has been added since the pictures were made. The self-contained drive described and illustrated in the article on my Wolf-Jahn lathe last December can also be used.

Reverting to the cross slide, this is bedded on both horizontal surfaces (see sketch Fig. 10). In the past, certain correspondents have said this was either impossible or, in any case, useless, as it would lead to uneven wear. I do not care to make pontifical statements, but these people are wrong on all counts. It is certainly not impossible to anyone with a reasonable degree of skill ; way back in the early 1900's when I was getting towards the end of my apprenticeship, I scraped-in the cross slides of half-a-dozen special 8-in. centre lathes in this manner and they were working just before the war, and may be still.

When those correspondents speak of uneven wear they surely cannot be using even elementary reasoning power ; provided the slide and its ways are reasonably rigid, this just can't happen. Consider the diagram, Fig. 10, for a moment. If surface " A " tended to wear, what happens ? Immediately, extra pressure is thrown on surface " B." No wear can take place in one plane without corresponding wear in the other. Certainly, this form of construction calls for rigid design and first-class workmanship ; but, given these, it is the best way of making slides.

The lathe under discussion still shows the original scraper marks on *both* faces of both slides and ways. Mr. Nathan Sharpe, at one time workshop superintendent of the S.M.E.E., would agree with this, as a letter of his on the subject in the columns of THE MODEL ENGINEER some years back will bear witness.

Just recently another very useful accessory has been added. This is a " Runbaken " grinding and drilling handpiece driven through a flexible shaft by a motor universally-mounted on a separate stand. A special adaptor was made to carry the handpiece in the toolpost and it can be used for divided drilling work, in conjunction with the division-gear, or for fine internal or external grinding. It is extremely handy as it can be fixed up literally in a couple of minutes. A foot switch is incorporated with it which is a great convenience.

The picture of the accessories shows : (1) Verical slide, (2) Dividing gear for vertical slide, (3) Milling, drilling and grinding spindle, (4) Sensitive drilling and grinding drive, (5) 8-mm. collets, (6) Drawbar and adaptor, (7) Faceplate with eccentric chuck, (8) Keyway cutting and slotting device, (9) Large collets, (10) Four-way turret, (11) Mandrel nose protector, (12) Large collet adaptor, (13) Centres and drill chuck, (14) Hand-rest, (15) Division plate, (16) Dial indicator gauge, (17) Direct indicator gauge.

Much remains to be done. For instance, a good filing-rest is badly wanted, and I am anxious to make up a substantial milling-device something like the " Abwood " but driven independently of the mandrel and having a swivelling head. But when it is stated that most of the work described was carried out between November, 1944, and March, 1945, I think it will be agreed that progress has not been too bad. I can, at any rate, say that if there is any fault with my machine work the fault is mine and not that of my equipment.

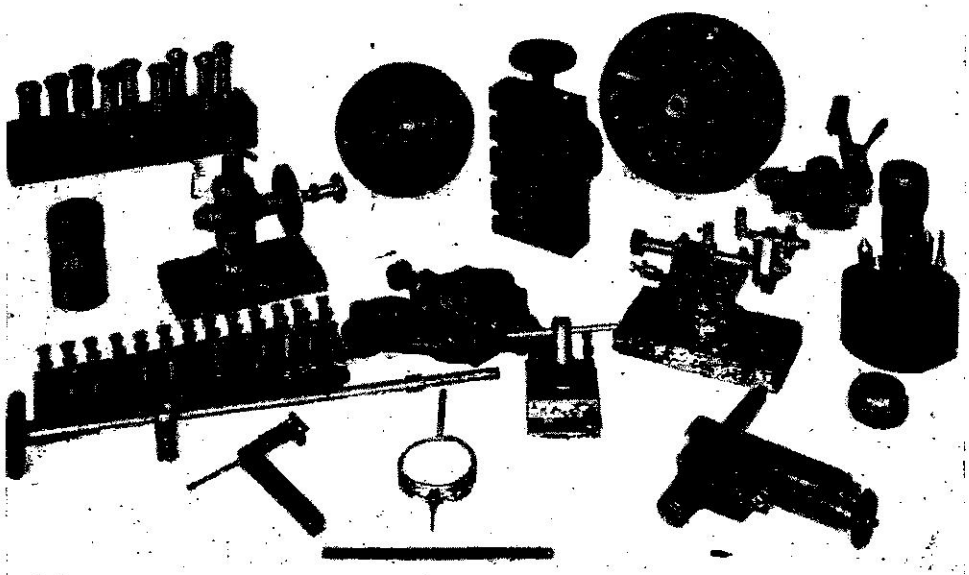


Photo No. 8. *Accessories and attachments*

MINIATURES IN THREE DIMENSIONS

by C.B.Maycock

SOLID models, or picture models, do not as a rule attract model engineers. This is understandable, as so many solids are too hastily stuck together and the all-important finish, which is the making of a miniature, is far too rough to appeal. However, this branch of the hobby can give great joy and satisfaction and is well worth while if sufficient trouble is taken. An accurate portrait of the prototype should be the goal and, in small scales, forms a direct challenge to your skill.

The first step, naturally, is to choose your prototype. The writer's pet hobby is aircraft; so, for the purposes of illustration, we will keep to this subject. Having obtained all the necessary data and every available photo from as many different angles as possible, one is ready to start the drawing. This is a very important step, as a tremendous amount is learned as soon as one commences to draw as accurately to scale as possible, and, all the time, methods of construction are formulating in the mind. This does not so readily occur with bought plans. Scale is a matter of choice; the more storage-space available, the larger the scale; that is, if more than one model is intended. The wings are usually the next step. It is a good plan to leave about 1/32 in. full all round the profile. This is a help in shaping the wing to airfoil section, particularly at the trailing edge. Whilst at this point, it is worth while to make at least one cardboard template of the correct section; the trouble is more than repaid in the finished article. When the wing is nearing final shape, but still about 1/64 in. full in chord, rub in some dental plaster with a damp rag and set aside.

In the writer's opinion, small scale fuselages are best made in two halves, with the joint running along the vertical centre-line. This enables you to hollow it out full length, and to fit as fully-detailed a cockpit as is consistent with the scale. If a piece of paper is sandwiched between, the halves can be lightly glued together for semi-final external shaping. Separation is an easy matter by inserting a knife-blade at a position where it will be covered, say by the wing centre-section, later on. Now finish hollowing out and paint inside final colour. Fit any internal details that would be awkward to fit once assembly has been completed. Glue together, sand-paper to final shape from templates, rub in dental plaster as described for the wing, and lay aside.

Detail work can now be proceeded with, also the making of simple jigs to ensure correct dihedral. Assembly jigs to ensure that the model stands true on its undercarriage for instance, and, if it be a biplane, to make certain that there is the right gap and rigging angles, which are as important to the look of the model as the angles and planes of the human face are to the personality of the individual. What would be the effect of a portrait of Winston Churchill with Joe Stalin's nose? The wing-struts of the Bristol fighter illustrated on the cover and the S.E.5A shown in the heading were split from an odd piece of bamboo curtain pole and sanded to shape. The centre section and undercarriage struts were made from copper wire flattened, and then shaped to streamline section. The pylon tailskid of the former was fabricated from suitably-sized wire and soldered in a simple fixture. The machine guns for both were filed from ordinary wire nails and soldered where required. The airscrews were cut from plastic similar to "Perspex," and painted and grained to represent varnished wood. This is not as difficult as it sounds, and the result is far superior to actual wood varnished, as the grain of wood is hopelessly out of scale. First, the plastic airscrew was given a coat of cream cellulose paint and, when thoroughly dry (that never-too-often-to-be-repeated caution), was coloured mahogany with oil paint, using dry-brush technique, thus giving the grain effect. Again, when dry, the whole was given a coat of clear cellulose. No! it did not peel off the oil colour as was feared.

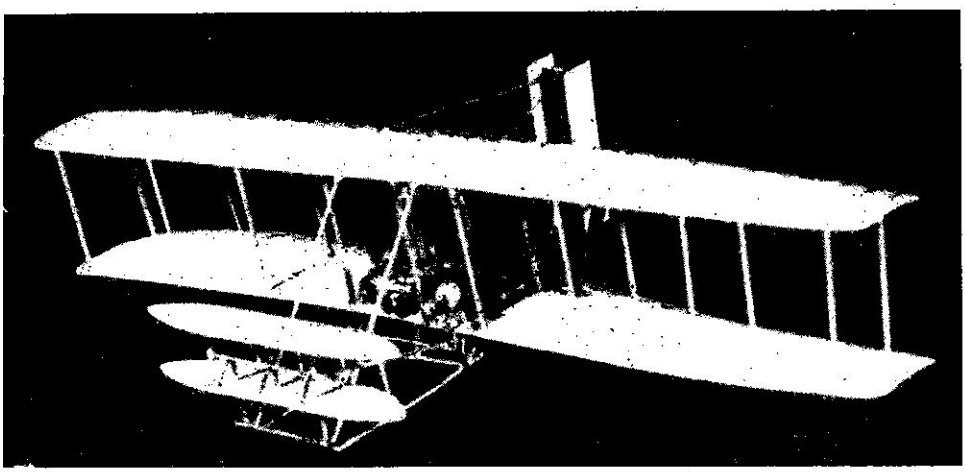
When all parts are made (by the way, it is surprising how many people forget the precaution of setting aside a special box for finished parts), and the model has been assembled "dry" for check-up, with adjustments where necessary, final painting of each item can be proceeded with. This method ensures a clean result, as on assembly, only a touch here and there with the brush will be required.

Now a word on the amount of detail to incorporate. Surely, it is better to have a few accurately made, true-to-scale details than to attempt to overdo it. For this reason, the writer does not attempt to add bracing wires to any biplane models under the scale of ½ in. to the foot. The wire would have to be of the spider's-web variety, consequently, too delicate to stand handling by other people. Secondly, if one were to be standing away from the actual machine at such a distance that it appears in proportion to 1/72-in. scale, the wires are almost invisible in normal light conditions. With regard to painting, the well-tried method of many coats thinly applied, rubbed down between each coat, cannot be beaten, but a little licence is granted in the materials of the prototype one wishes to convey. A case in point: by all means, give a super finish where one is imitating metal panels; but where fabric-covered structure is called for, a contrast in texture is demanded. The author has seen many professional models which have been spoilt, from the point of view of realism, by being too highly finished. To his mind, a model should look exactly like the real thing in miniature and not be too "dolled-up." For undercoating, after the grain has been filled with dental plaster and rubbed down, the author uses clear cellulose.

The PFALZ. D. III fighter of the 1914-18 war. Note radiator in top centre section and control horns to ailerons

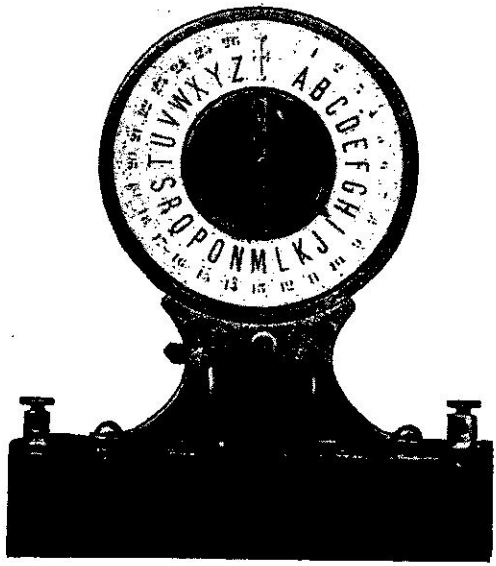
Provided one works with plenty of thinners, very satisfying results can be obtained with cellulose colours; most dopes, as sold, are miles too thick. Brushes should be washed out in a pot of thinners between *each* application and not allowed to harden. A good brush is worth every care anyway.

Representing the ribs and riblets on fabric-covered wings has always been a bit of a problem in small scales. A satisfactory method the writer hit on is to rule them with a draughtsman's ruling-pen charged with poster colour, when the wings are at their finished size and undercoating stage. Then, when finally painted, just the right amount of relief for the scale is given.



The original 1903 Wright Biplane modelled to 1/72nd scale. Note the incorporation of wing warp, and the pilot lying in the prone position. The latter was carved from a piece of 3/8" dia. birch dowel

INFORMATION WANTED



"*Receiver*"

A CORRESPONDENT, who has been a regular reader of THE MODEL ENGINEER for over twenty years, submits the reproduced pictures, which are of a very early type of alphabetical telegraph, similar to that used on the French Railways about 100 years ago. The pointer on the dial keeps in step with the "handle" of the transmitter, enabling the required message to be spelled out letter by letter.

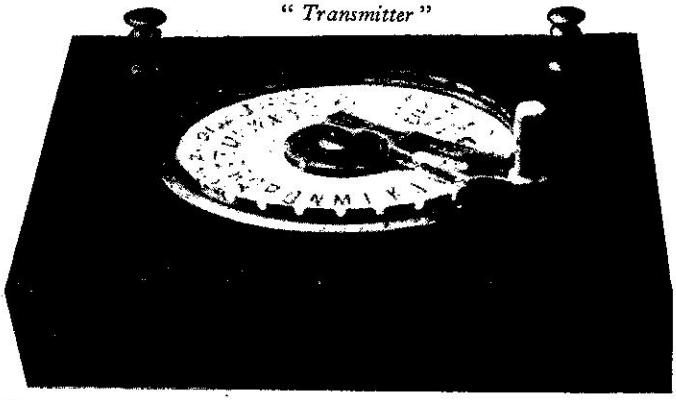
Operation of the pointer is by means of an electro-magnet and a form of clock escapement, which advances the pointer one letter at a time, as the transmitter applies and withdraws current from the "line."

The "transmitter" consists merely of a fourteen-tooth star-wheel and a couple of contacts to make and break the circuit for each alternate letter. A bell is provided on the "receiver" for calling attention.

The apparatus, in a very dilapidated condition, was "discovered" in a Birmingham second-hand store, but after being dismantled, cleaned, and reassembled, and one or two missing parts replaced, functioned perfectly.

Can any reader throw any light on one or two points which are troubling our correspondent? Although there is a certain resemblance to the "Breguet" instrument, as used on the French Railways, this does not appear to be of French origin, nor is the operation of the "receiver" by clockwork, as Breguet's was. Who made it, and where was it used? The frame of the "receiver" is a very fine brass casting, and the dials are very well printed, which seems to indicate that this was not the only instrument made. Can anyone say how the changeover from "letters" to "figures" was indicated to the recipient of the message?

"*Transmitter*"



The "transmitter" is approximately 5 in. square, and the "receiver" 5-in. high. Is it, therefore, the actual apparatus, or is it a model, perhaps made by some ingenious clockmaker for experimental purposes? If so when and where?

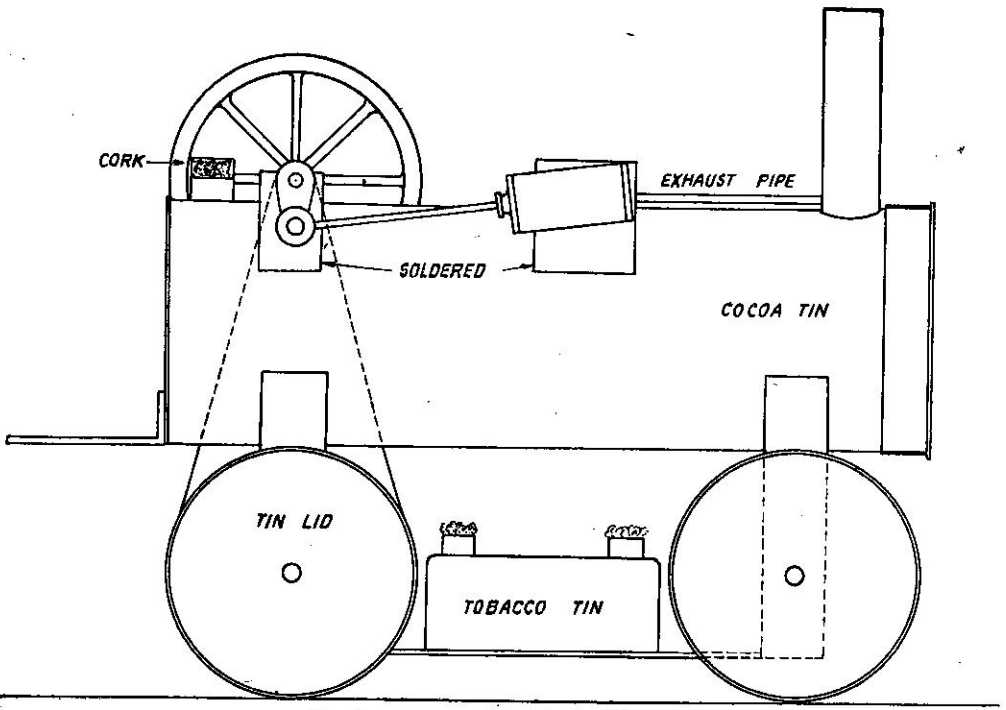
The photographs were taken by Mr. C. J. Beekes.

RANDOM REMINISCENCES

By "L.B.S.C."

THE drawings of the motion-plate, guide-yokes and valve-gear for the "Lassie," are taking longer than anticipated; in fact, I haven't yet finished tinkering about with my bits of tin, cardboard and pins, by which means I get the lengths of the various components, and make certain they work all right. This week, therefore, we will give the "galloping sausage" a rest; and instead of dishing out the usual instructions, have a sort of general chinwag with the good folk who look to these notes for sugar as well as pills. Speaking of the above-mentioned tins, pins, and cardboard, I have received many requests to spill the beans on the manner in which I scheme out a valve-gear which apparently does the job as well, or better, than those set out in the manner usually observed among the drawing-office staff. Well, to be quite frank, in that respect I am completely stumped; all I can say is that it is just a kind of instinct! Guided by a sort of "mental photograph," in a manner of speaking, the bits are cut out and put together, and if the valve doesn't operate as required, the various centres, lengths of rods and so on, are altered until it does. I don't have to work the wheeze when actually building a locomotive, for as soon as the cylinders, connecting-rods, etc., are erected, I can usually fit the valve-gear right away, merely getting vital measurements from the actual job. For instance, take a 4-6-0 with Walschaerts gear; I know, naturally, how much lap the valves have, and how much travel is needed on the valve to give the crack of lead in mid-gear, which settles the movement of the top of the combination lever right away; so that component, and the union-link and crosshead-arm, can be made and erected without any calculation, nor even a pencilled line.

With the piston at half-stroke and the combination-lever vertical, a point is taken somewhere about halfway between the combination lever and the driving-axle centre; I make it a round figure if possible, hating thirty-seconds and sixty-fourths. That settles the position of the link trunnion, radius of link, and length of radius-rod, without further ado; and those parts are then made and erected, the link being carried by either girder or bracket as convenient, or according to what is used on the full-sized engine, if one is being copied. The amount of link oscillation required, is found simply by wagging its tail until it gives the required amount



The first attempt, à la Trevithick

of port opening in full gear, and the return crank is made and fitted right away, to give the requisite movement. It is set with a pair of dividers, as described in dealing with Walschaerts-gear engines in previous notes. The eccentric-rods are made to the measurement indicated by the divider points after setting the return cranks, the rods are erected, and Bob's your uncle! I'm sorely afraid the above will upset the equanimity of my good friends of the various locomotive drawing-offices; but the few who have seen one of the engines performing on the road, certainly don't deny that the method, though simple to absurdity, is very effective! When getting out instructions for a locomotive that I have not actually built, such as the "Lassie," I have to fall back on the pins-and-cardboard method, to make certain of the measurements, before making the drawings that builders of the engine will follow in good faith.

Many years ago, there was an argument in the correspondence columns about valve-gears, settings, and so forth, and I remember one of the "combatants" saying that he had spent several days at a drawing-board studying the various events of a certain valve-gear. If he had made up one of my cardboard-and-pin contraptions, he could have discovered the whole shoot in about ten minutes, and the said gear would very likely have taken a back seat! Incidentally, anyone who searches through the back volumes of this journal for information on valve-gears, needs to use great discrimination; because some of the valve-gears described, in the light of modern efficiency, weren't worth the trouble of making and fitting. Experience still teaches!

Early Efforts

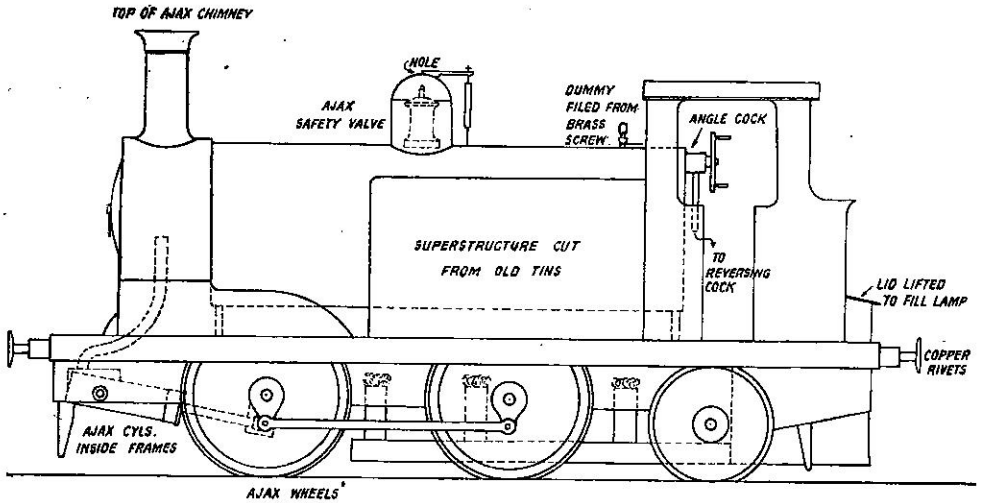
Readers who ask for more Curly tales and childhood reminiscences, frequently want to know what sort of locomotives I was able to build on the kitchen table, or an equivalent, with the simplest of hand tools. They can hardly realise that it was possible to put something on the track (or the kitchen linoleum) that would turn its own wheels under steam, without using a lathe or proper tools of any sort. Well, as I said before, it is a bit of a job to take a look backwards along Memory Lane, and still see the other end of it over fifty years away; but recollections of some of the antics I got up to, still stand out, faint but perceptible. I learned how to use a soldering bit, by watching a tinker at work mending pots and kettles and other domestic articles; nobody ever accused young Curly of not keeping his eyes open. Much I found by experience, such as the fact that copper and brass needed to be very clean for a good soldered joint, and required more heat than tin. My first attempt at riveting, was when the rivets in the front end of the frame of my tin "Ajax" came out. To replace them, I got two copper flat-head rivets and two washers; with the heads inside and the washers outside, I managed to flatten the stems on to the washers, which held the tin frame together, and did not look unsightly. When one day I saw the tinker—whose shop was an open-sided shed between two houses in a side street—rivet a handle on a pail, I learned how to "head" a rivet. As already mentioned in earlier notes, I put my acquired knowledge to use by doing a travelling tinker out of his job as far as the Crescent was concerned, and took care that the housewives never had any cause for complaint, which was more than could be said for the tinker!

My locomotive building compared pretty well with the history of full-size locomotives. Everybody familiar with locomotive history knows about Dick Trevithick's engine with a single cylinder, big flywheel, and drive through gear wheels. Mine had a single cylinder, flywheel, and drive by a cotton belt. My tools consisted of a soldering bit, carpenter's rule and square, and a couple of worn files (relics of a "pre-natal" grandfather), an old pair of scissors, and an Archimedean drill from a child's fretwork set. I also had an old carpenter's chisel, with neither handle nor tang. With these, and empty cocoa-tins for material, I built a locomotive that "went." One tin made the boiler, with the lid soldered on, and the other end and seam soldered over to make it tight. Four pieces of tin were soldered to the sides, forming bearings for the wire axles. The wheels were four lids; to find the centre, for attaching to the axle, I measured the diameter, and then scribed a circle same size on a piece of paper with my school compasses. This was cut out and put inside the lid; the drill was applied at the point where the compasses had made a hole in the paper, and a mark made on the tin. After marking all four (I had no centre-punch) the holes were drilled with my one and only drill, and reamed out with the point of the scissors until the lids were a tight fit on the axles, to which they were soldered. As the lids had a slight bead, they looked something like flanged wheels with wide treads.

The cylinder and flywheel came off a discarded toy stationary engine; I forget now where I got them. They were mounted on top of the boiler, and the exhaust pipe went into a dummy tin chimney. At the back end of the boiler I made a hole with the scissors, soldered a tin ferrule into it for filling purposes, and plugged it with a cork, as I had no screw fitting, or any means of making any. The grey matter under the golden curls figured that the boiler could not explode, as the cork would blow out first; as a matter of fact it did, more than once! The two-wick spirit lamp was made from a small flat tobacco tin, carried on a bracket between the two axles. The flywheel, like Trevithick's, was well to the rear, so that the cotton belt which ran from the small pulley beside it, to the ex-lid-wheel just below, was well clear of the lamp. This crude contraption worked first time, and to such good purpose that its first run ended in disaster—not to the engine, but to the mat at the street door; for it sprinted away, and before I could catch it, it climbed the mat, overturned in the process, and decanted blazing methylated spirits all over the said mat, which didn't improve its appearance. Poor mother was dismayed, but I made it up to her.

I had not then been on this planet long enough to attain a double-figure age. Sometimes, when working in my present "shop" (which, by the good rights, should be the dining-room, but

somehow got off the road!) I fall into a sort of daydream, and wonder what would have happened if I had been born of well-to-do parents, who would have sympathised with my ambitions, and encouraged me in every way. I can just picture young Curly with a proper workshop containing a good lathe, drilling-machine, planer, grinder and other essentials, and all the hand tools he needed, putting all his energies into building a real small edition of one of his dearly-loved Brighton engines. I can imagine a genial "dad" breezing in after tea with a cheery "Hallo, Dolly, how's Brighton Works progressing—can you take me on as fitter's mate?" and mother chipping in with "Don't you give him a job; why, he can't knock a nail in the garden fence without bending it and bashing his thumb!" and both of them taking a pride in the progress of the little engine. Instead of going to work in the locomotive sheds for one-and-eightpence per day, Curly might have become a premium



Three years later

apprentice at Brighton, with the chance of rising to succeed Billy Stroudley; that is, if he could have managed to keep off the footplate! A dream indeed; well, it costs nothing, and anyway I have the workshop of my heart's desire now, even though it be late in life. The old saw says, "Everything comes to those who have patience to wait." True enough, if you don't do the waiting part sitting down or sleeping!

Some Gift!

Coming back to stark reality, granny was my best source of encouragement. She it was who provided the funds for the tin "Ajax," as I have already recounted. Mother was too busy trying to keep the home going, to worry much about me, knowing I would never betray her trust to keep out of trouble and danger. I am writing this on a Bank Holiday; it recalls another Bank Holiday somewhere around fifty-five or more years ago, when young Curly put some food in his miniature engineman's "tommy-bag," filled his tea can, and set off soon after 6 a.m. to see how far he could walk in a day without getting too tired. He followed the line of his beloved railway as near as possible, through Dulwich, Tulse Hill and Streatham, then turned south and went through Norbury, Thornton Heath, Croydon and Purley, and finally climbed up to Riddlesdown about four in the afternoon. He had made sundry stops to watch the trains at various points, and the food had all gone and the tea can was empty. Up on Riddlesdown there was a fair, and a small outside-cylinder single-wheeler of ancient design was hauling children around a circular track about 18-in. gauge. Curly sat on the grass and watched this for some time, being too shy to go and talk to the driver; when rested, he found a refreshment-tent where he got a good cup of tea and some cakes for twopence. He then walked back to East Croydon station, bought a half-ticket for London Bridge, and to his great delight got a window seat in the carriage next to a "Gladstone" which did the run non-stop. From London Bridge he took the "local" home to Queen's Road, arriving about 9.30 p.m. Mother got me a combined tea-and-supper whilst I was having a bath—which I needed!—and then I went straight to bed and got in about 9½ hours' unbroken sleep. That is how a strong healthy boy had a day's real enjoyment at a cost of less than a shilling, in the *really* good old days. Many a time during the sleepless nights in the 1940 raids, and during the doodlebug period, I longed to be back in the peaceful past—can you wonder at it?—and regretted ever growing up.

However, I was going to tell you about the gift. As I mentioned once before, it was only occasionally I saw my father, and he took as much notice of me as if I never existed, except on one occasion. He was frequently away for weeks at a time; what he did or where he went, I don't know to this day. When home, he did not usually come in until I had gone to bed, and

I was off to school long before he got up next morning, going out again before I came home to tea. Well, one evening I had been trying to fix up an exhaust-pipe on "Ajax"; she had no exhaust pipe as originally built, the steam exhausting through the backs of the cylinder-blocks and blowing the lamp flame about. I had two or three odd bits of brass tube, but they were no good for the job, and I had just started clearing up my corner of the table, when my father unexpectedly came in. He had apparently been looking on the wine when it was red, and the whisky when it was yellow, being in that state when he wanted to be "pally" with everybody. He asked what I was doing, and I told him, saying I couldn't finish the job because it needed a piece of copper pipe and I had none, nor any money to buy it. With a maudlin sort of smile, he said I was a good kid and ought to be helped, and he would give me some money; and then gravely produced—hold your breath and don't laugh too much—*one penny*, and said I could go tomorrow and buy the tube with it!

I took the coin and thanked him just as gravely; Curly could always be very demure when occasion demanded it. A fortnight or so elapsed, during which time I earned a few more coppers by going errands and doing odd jobs, as mentioned in previous reminiscences. Then, one Saturday morning, accompanied by the boy who came with me to buy the "Ajax," I set out for the City, had a look around Farringdon Market, went on to Clerkenwell, called at Smith's, and bought a piece of 5/32-in. copper tube about 3½ ft. long. In those days this size was about 1s. 9d. per lb., and my piece came to threepence; so it came to pass that the penny gift actually did pay for the exhaust pipe for "Ajax." Incidentally, Lee of Shaftesbury Avenue and Stevens of Aldgate, sold the same kind of tube in foot lengths at sixpence each, so the leopard had plenty of spots even in those far-off days!

"New Lamps For Old"

The first locomotive that I built, that really did bear some resemblance to a full-sized engine of even date, was after the tin boiler and frame of "Ajax" finally gave up the ghost, and solder-patching became impossible. In a previous note I related how I accidentally discovered a broken "twin" to "Ajax" in a junk store, and the proprietress let me have it for threepence. True, the only parts fit for salvage were the four brass wheels, one cylinder, steam-cock, safety-valve and chimney; but they were a good three-pennyworth! With that and the relics of "Ajax" I set to work to build something like a "D"-class tank. Starting "upside down," the first thing I made was the running-boards, beading, and footplate; sounds a bit strange, but then I was only following the design of the engines with cast "bedplates" which were in the "model" shops. What I made was a long shallow tin lid, the length and width of the engine; and underneath where the boiler would be, I chiselled out a long rectangular opening. The main frames (more tin) were then cut out, bent over at the top to form angles, and riveted to the underside of the "lid" at each side of the boiler opening, with a few brass boot rivets. The axles ran in plain drilled holes, reinforced on the outside with bits of brass riveted on, to serve as axleboxes, and to keep the wheels from rubbing against the frame. The two pairs of coupled wheels were in front, and "Ajax's" old leading wheels at the rear; it wasn't half a job screwing the coupled wheels on to the axles, with the running-board in place, and the wheels in the clearance slots. Also I had to put the crank-axle in place before riveting on the second frame. You good folk who follow my "words and music," and have no trouble in making your parts and erecting them, little realise the desperate struggle it was, in the days gone by, to build even a caricature of a locomotive without guidance!

The two single-action oscillating cylinders which had done duty on "Ajax" were put right in front, driving the crank axle, the steam blocks being soldered to the frame. The two cross-pipes were connected to a four-way cock (out of the Farringdon Market "treasure-box"), connected to a lever in the cab for reversing purposes. The boiler was a plain cylindrical "pot" boiler with a tin smokebox made like those on the "D"-class tanks; this was open at the bottom. The exhaust pipe discharged up the "ex-Ajax" chimney, the cap of which had been altered to as near the Brighton pattern as possible. The regulator was an angle-cock on the rear end of the boiler, the pipe passing along underneath in the lamp flames. I had already discovered about superheating, as mentioned before, and a small brass oil-cup was fixed on the steam-pipe close to the reversing-cock. The boiler was fired by a three-wick spirit-lamp, the dummy side tanks acting as shields for the flames. The superstructure was made of tin, all soldered together. When the engine was painted, she looked very realistic, and the oscillating cylinders being inside, between the frames, there was nothing visible to betray her extreme simplicity. Young Curly was very proud of his first attempt at realism, and it worked really well, but, of course, had very little power. It lasted right up to the time I built the Sutcliffe-Stevens single-wheeler mentioned in the notes about remote control. Any follower of these notes who wants to build a simple toy for a child, might do worse than copy; with a thin copper boiler, stouter wheels, and better workmanship, it would work well, last a long time, and bring joy to an engine-loving kiddy's heart.

The construction need not, of course, be so absurdly simple as mentioned above, as that was due to lack of proper material and tools; the frames could be made up from sheet steel about 18 gauge, in "regulation" style, with bushed holes for axle bearings, and buffer beams of 3/32 in. by ¾ in. strip. Frames should measure 2¾ in. over the outside, to enable the engine to run on 2½-in. gauge rails. Ordinary iron wheels would do. In any "pot-boilered" engine, friction should be cut to the minimum; and for that reason, a solitary double-action oscillating cylinder would be better than two single-action cylinders, needing only one crank, one piston, and one port block with steamways drilled in it and the reversing valve attached to the back. This eliminates all external pipe connections. Boiler joints should be silver-soldered.

*THE HANDYMAN 100 YEARS AGO

By G. A. GAULD

IV—Ratchet Type Substitutes for the Crank

MANY of the nineteenth century inventions designed to displace the crank employed some form of ratchet drive. By means of ropes, pulleys, chains, rack-and-pinion gear trains, the alternating movement of the piston-rod was applied through ratchets to the flywheel shaft, and rotary motion produced. Needless to say, many of these designs were extraordinarily complicated and one feels that they could never have progressed beyond the drawing board. None of these mechanisms provided for the acceleration and retardation of the piston, and impact effects alone would have brought about their early failure, quite apart from the relative fragility of the ratchets and pawls which were called upon to transmit the whole pressure of the steam behind the piston.

A mechanism due to Matthew Murray, of Leeds, illustrates the type in Fig. 1. It is interesting, not so much as a crank substitute, but in the use of the screw to form a two-way automatic clutch, instead of the more common

* *Continued from page* 448, " *M.E., May* 2, 1946.

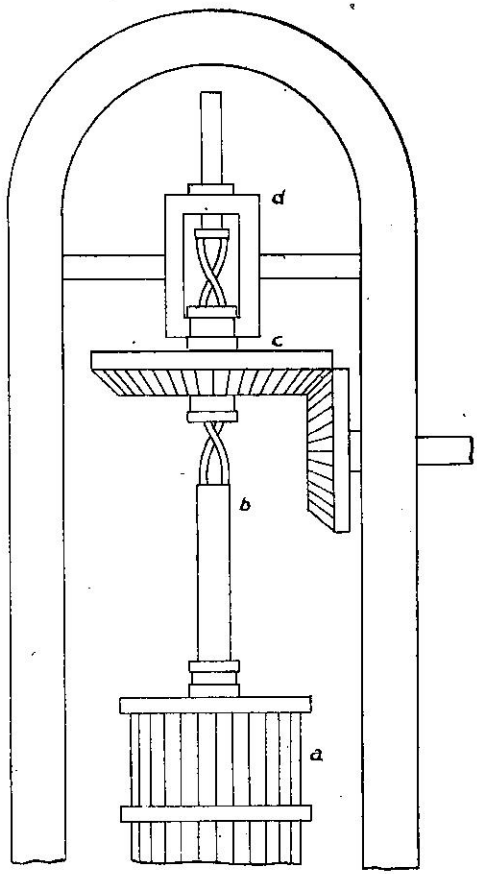


Fig. 2

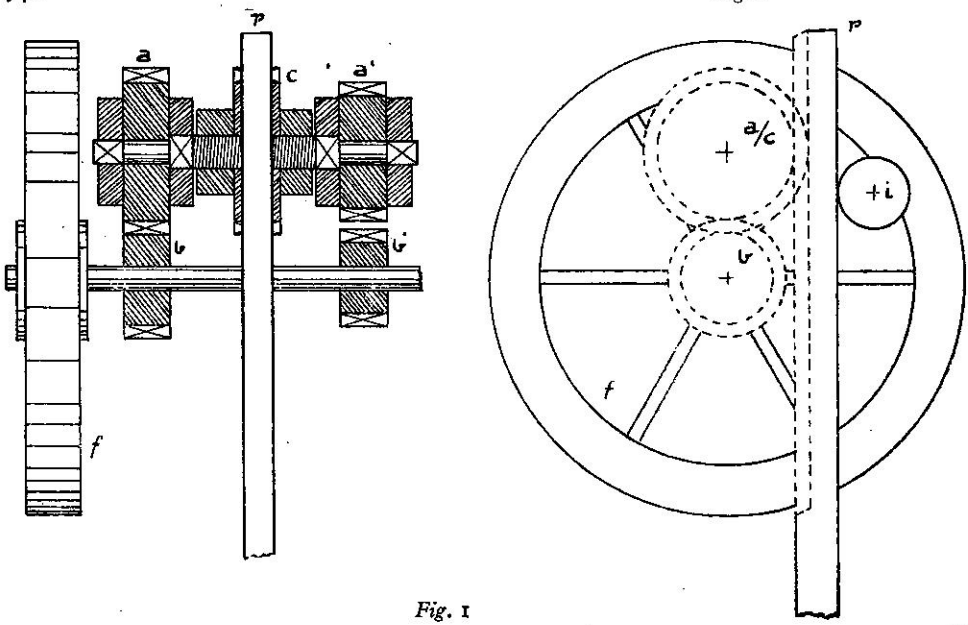


Fig. 1

ratchet. The vertical rack *r* is attached to the piston-rod and gears into the wheel *c*. The bore of this wheel is screwed with a fairly fine thread and is mounted on a shaft, the centre portion of which is screwed to correspond. The gears *a* and a^1 are free to rotate on the shaft; the inner discs are a loose fit on a squared section of the shaft and so must rotate with it; the outer discs are firmly fixed to the shaft.

As the piston and rack *r* rise, the wheel *c* tends to move along the screw towards the left, pressing upon the loose disc and thus pressing the gear wheel *a* against the fixed outer disc. The gear wheel thus becomes locked and the movement is transmitted through the gear *b* to the flywheel shaft.

When the piston descends, the movement is transmitted through the gear a^1 and an intermediate wheel, not shown, required to reverse the direction, to b^1. Thus, with each stroke of the piston, the impulse is transmitted to the flywheel shaft, impelling it in the same direction each time, and rotary motion is obtained.

Another gentleman of Leeds produced another form of engine in which the crank was completely disposed of. It is of particular interest to us, as mention is made in his letter to a friend dated May 20th, 1842, of building up the design in model scale before attempting the full-scale engine (see Fig. 2):—

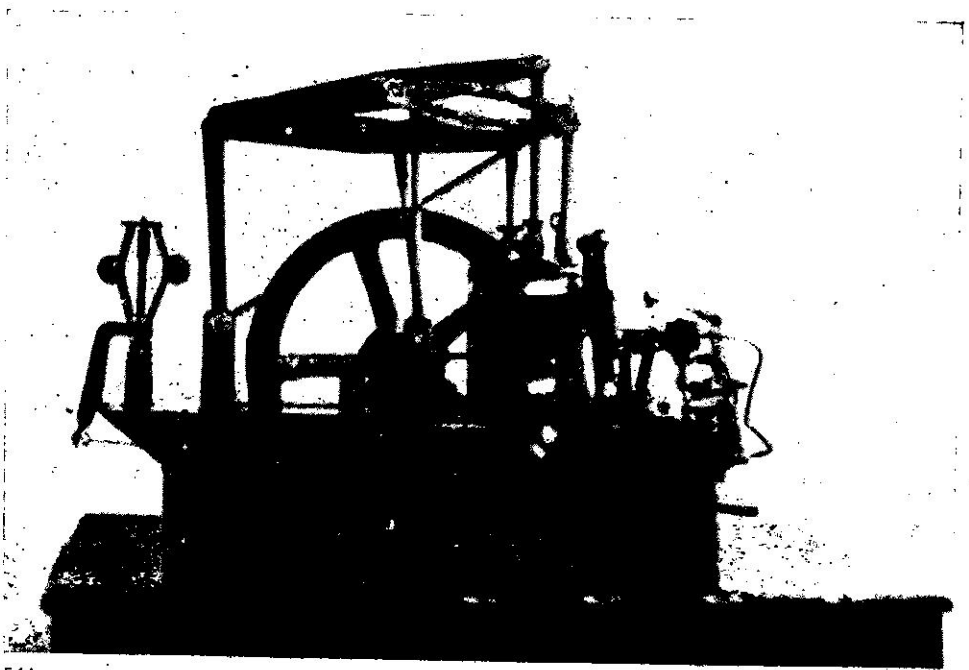
"*a* is the cylinder, and *b* the piston-rod, which is continued by a shaft upon which is chased a right and left-hand thread. These cross each other, and are made of such a pitch, that the shaft would descend in a female screw by its own weight. These threads are square and fitted into the nave of the flywheel, so that when the piston ascends, the wheel is made to revolve, the piston-rod being kept from moving round by a bush fixed in the bearer *d*, in which the top part of the piston-rod works, this part being square. As the piston again begins to descend, the left-hand thread of the piston-rod enters the corresponding worm of the nave, and the flywheel still continues to revolve in the same direction as before. Thus, at the end of every stroke, both the direction of the piston and the working thread are reversed, and therefore the wheel continues to revolve in the same course. This, it will be seen, has a slight tendency to move in a vertical direction, which is prevented by the bearer *c*.

It might appear that there would be an inconvenience attending the changing of the right- and left-hand thread to the females of the wheel. This is not, however, the case. A small engine was made here of the construction described, and under my directions, and it works very well."

It is to be hoped that the model showed up the snags, saving the waste of time and effort that might have been put into the construction of a full-size engine.

(To be continued)

A model two-cylinder Grasshopper shop engine built by T. P. L. Mummery, from scrap material. It has a stroke of 2 in. and a bore of $\frac{9}{16}$ in.; it runs at about 130 r.p.m. The cylinders are mahogany lagged, and fitted with a mechanical lubricator.



Letters

Model Motor Cars

DEAR SIR,—I read with considerable interest Mr. W. Boddy's article in THE MODEL ENGINEER of April 11th last, and note that in giving some particulars of the more outstanding cars that have been made he omits three of the finest models ever produced. I refer to the cars made some years ago for the Queen's Dolls'-house. As far as I remember, these were perfect scale models as to externals; I know that *one* was, as I played a minor part in the job, having handed to the then managing director a sheet of suggestions as to what should work and what should be dummy. My hints were adopted, and the man who actually did the work was one of the foremen, relieved of his ordinary duties. He made a beautiful job of the chassis, and a body-shop man made the dinky little body. The little wire wheels were built-up, as are the real ones, and were in themselves little works of art.

I have seen the beautiful model of the "Silver Ghost" many times, and am still wondering whether it is a working model. Certainly the scale to which it is built would be in its favour.

The first model car to be described in THE MODEL ENGINEER is in the number for July, 1899.

Now as to the Vauxhall chassis mentioned by Mr. Boddy. It was not "completed around 1912"; in fact, it was not quite complete when, in 1922, it won the first Championship Cup and Silver Medal given by THE MODEL ENGINEER at the exhibition of that year. It is a full working model, all parts of the clutch, gearbox and back axle being correctly reproduced. Inspection of the model would show this, as the lid is off the gearbox, and part of the back axle casing is cut away to show the crown-wheel and differential. A photograph of the latter also was reproduced in THE MODEL ENGINEER some years ago. The engine merely had a special camshaft to enable it to run on compressed air. I think it would puzzle even Mr. Westbury to get six cylinders of that size to function properly on a one-eighth scale 30 mm. White and Poppe carburettor of 1910 vintage. It would be most interesting to see (and hear) him try!

How many readers, I wonder, possess one of the beautifully-made die-cast paperweight models of the early single-cylinder water-cooled engines of Messrs. De Dion Bouton? My model bears the date 1901, and stands 4½ in. high, including a 1-in. high base.

Yours faithfully,

Luton. ERNEST W. FRASER.

Model Traction Engines

DEAR SIR,—Following your "Smoke Ring" in THE MODEL ENGINEER of March 17th, entitled "A Traction Engine Dream," I would call attention to a Dutch publication, *De Erch*, at Hengelo, Holland, which contains a description of a steam traction engine, one-twelfth scale, with twenty-eight fully-detailed drawings. The price is five shillings.

Yours faithfully,

9, Everard Foeckstraat, Utrecht. J. TACONIS.

Photographic Enlargers

DEAR SIR,—I refer to the letter from Mr. D. A. Cresswell in the April 11th issue of THE MODEL ENGINEER, in which he comments on the position of the ground-glass diffuser in the enlarger.

The enlarger was designed from information gleaned from numerous sources, and also from a considerable number of actual experiments, in the course of which the diffuser *was* tried in the position indicated by Mr. Cresswell. This position was found to be unsuitable owing to the fact that when the negative was in focus, the grain of the diffuser was distinctly noticeable superimposed on the projected image, because of depth of focus effects of the camera lens.

The diffuser definitely cuts down the light intensity somewhat, but a very intense light is unsatisfactory for enlarging purposes owing to the callier effect, and gives hard and contrasty pictures.

With pin-point lighting and condenser only, it becomes imperative to focus the light source for each degree of enlargement, but with the diffuser in place this becomes unnecessary.

I have come across only one instance where it was recommended to place the diffuser between the condenser and the negative; in all other cases the recommendations were to position it between the light source and the condenser.

Yours faithfully.

Winchester. C. R. JONES.

Compound Steam Traction Engines

DEAR SIR,—I was very interested to see the letter about compounding in traction engines. I have a few observations to add on this subject.

There is a tendency on the part of any driver to regard his engine unique, or at any rate, one of a very small batch. Therefore, statements of this nature should be taken with a lot of salt.

The "cross compound" of Burrell's design was a very popular engine and was used on all sizes by that maker from 16 h.p. down to 6 h.p. or less. Examples of other methods of compounding are seen in the two-cylinder double-crank compounds of straightforward design with two sets of valve gear (generally Stephenson's link), the tandem arrangement of cylinders and the Wallis expansion engine. These had two valve-gears superimposed distributing steam to one jacketed cylinder. The purpose of the uppermost D-valve was to achieve a very early cut-off without affecting the pattern of the exhaust end of the indicator diagram.

There may be other methods of compounding, and if so, I should be glad to hear details from any of your readers.

I have driven a Burrell "cross compound" for two months every day and have had about the same experience on simple engines and double-crank compounds of various makes. I can say truthfully that the Burrell simple engine is easily the most pleasant to handle of any traction engine and that the double-crank compound is better in this respect than the single-crank. In the matter of economy of fuel, there is little to choose between various methods. The skill of the driver is the most important factor.

Yours faithfully,

Basingstoke. GILES ROMANES, M.R.C.S.

Clubs

York City and District Society of Model Engineers

The next meeting will be held on June 1st, 1946, in No. 11 Room, Co-operative Hall, Railway Street, at 7 p.m. sharp. The Society's locomotive will be discussed, so will all interested please attend.

Will all concerned please note, the above title is the only one for this Society, and all others are cancelled with effect from date of this notice?

Hon. Secretary: WM. SHEARMAN, 28, Terry Street, York.

Brighton and District Society of Model and Experimental Engineers

The annual general meeting was held on Friday, May 3rd, when all officers were re-elected *en bloc*, as they had only served actively for a few months since the revival of meetings. Balance sheet was read and showed a very healthy financial position.

A track is being built at Shoreham, and will soon be ready for use by members of the Society for their locomotives.

Forthcoming events: May 31st, Jumble Sale; June 14th, Brains Trust on Model Engineering Subjects.

Hon. Secretary: E. L. MEAD, 73, Langdale Gardens, Hove. Tel.: Hove 2376.

Sheffield Society of Model and Experimental Engineers

Since the last notice of club activities was published we have changed our meeting place to the W.E.A. House Western Bank, and hold meetings on the first and third Thursdays of the month, at 7.30 p.m. The next meeting, on June 6th, will be held at the Track at Frecheville, at 7.0 p.m.

All members who wish to help on the building of the track will be welcome any Sunday at Frecheville at 10.0 a.m.

We have just held a very successful exhibition, at which Mr. Westbury was very interested and acted as Chief Judge.

Hon. Secretary: ARTHUR F. CLAYTON, 76, Trafalgar Street, Sheffield 1.

The Kent Model Engineering Society

The club is now preparing its passenger-carrying railway for the coming season, and further extensions to the track are nearly ready. Two new passenger trolleys have recently been completed, and it is expected that a new 5-in. gauge locomotive will make its appearance on the track.

On Sunday, June 2nd, a combined track run and exhibition of members' work will be held at the club headquarters; members' wives and lady friends are invited. In the evening, a film show will be given by Mr. Bernardes.

The track run will commence at 2.30 p.m.

The following meetings have also been arranged:—

June 3rd—Rummage sale.

June 17th—Major Binyon will show a collection of lantern slides of various types of machine tools. These slides form part of the club library.

The passenger-carrying railway will be in operation on the following dates:—

June 10th, at Keston Avenue Schools, Old Coulsdon. June 22nd, at the Boy Scouts' Association Fête, Eltham Palace Grounds. July 27th, at the Standard Telephones and Kolster Brandes' Fête, Sidcup.

Secretary: A. F. BROCK, 342, Green Lane, New Eltham, S.E.9. Telephone: ELT. 2342.

Leeds Model Railway and Engineering Society

A general meeting will be held on Sunday, June 2nd, 1946, at the new meeting room, Geldard Road.

Mr. D. Hodgson will address the meeting with a most interesting talk, entitled "Empty Cans to Scale Models."

Hon. Secretary: J. W. SEYMOUR, 12, Outwood Walk, Horsforth.

The Medway Model and Experimental Engineering Society

Our exhibition, to be held at Chatham Town Hall on September 14th to 21st, inclusive, will achieve much. We will appreciate all the support our fellow societies and clubs can give. For any further information please contact the Hon. Sec.

On June 9th, Whit Sunday, we are running a "Field Day," at Horsham Farm, Rainham, Kent (Upchurch bus stop), by the kind permission of Mr. Jenkins. The "day" will commence at 11.00 hours, and close at dusk; all are welcome. Just roll along, friends, with your aircraft and boats; there are fine flying fields and a grand boating lake available, and we know a grand day will be had by all.

Hon. Secretary: MR. HOWLETT, 59, Bryant Road, Strood, Rochester, Kent.

Burnley and District Society of Model Engineers

We are holding our first exhibition, in aid of the local hospital, on Thursday, June 20th, until Saturday, June 22nd, 10.0 p.m., at the Church Institute, Manchester Road, Burnley.

The times the exhibition is open: Thursday, 6.0 p.m. to 10 p.m.; Friday, 6.0 p.m. to 10.0 p.m. Saturday, 9.0 a.m. to 10.0 p.m.

We hope all who are interested in model engineering will come and see it.

Next meeting will be held at Accrington, in The Rechabites' Hall, on Friday, May 31st, at 7.30 p.m.

Joint Hon. Secretaries: MR. J. D. MEE, 2, Windsor Avenue, Church, near Accrington; and MR. A. BATY, 36, Mosely Road, Burnley.

NOTICES

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects, which should be addressed to him at 23 Great Queen Street, London, W.C.2. Matter intended for publication should be clearly written, and should invariably bear the senders' name and address.

Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All correspondence relating to sales of the paper and books to be addressed to THE SALES MANAGER, Percival Marshall and Co. Ltd., 23, Great Queen Street, London, W.C.2.

Correspondence relating to display advertisements to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," 23, Great Queen Street, London, W.C.2.

"THE MODEL ENGINEER"
SALES AND WANTS

Private: **Threepence** *word*. *Trade*: **Sixpence** *word*. *Use of Box* **2/6** *extra*. *Minimum charge*, **3/-**.

TOOLS & WORKSHOP

Buck and Ryan's Department for Lathes, Drilling Machines, Grinders, Electric Tools, Chucks, Surface Plates, Lathe Accessories and Tools.—310-312, Euston Road, London, N.W.1. Telephone: EUSton 4661. Hours of Business: 8.30 to 5.0 p.m., Monday to Friday; Saturday, 1.0 p.m.

Split Chucks for Watchmakers' Lathes, 6 mm., 6½ mm., and 8 mm., at 7s. each, postage 6d.—JOHN MORRIS, 64, Clerkenwell Road, London, E.C.1.

"Tool News" keeps you up-to-date. Specimen copy 6d., post free.—GARNERS, Sheffield Road, Barnsley.

Wood Workers. Send S.A.E. for details of our new W.T. Lathe.—GARNERS, Sheffield Road, Barnsley.

Pratt 4" Self-centring Chuck, new, £2 10s.; ½ Jacobs Chucks, 10s. 6d. S.A.E. for list.—4, Rosslyn Avenue, Ruthergien.

Sale, 3" Lathe, B.G.S.C. (similar Myford), Myford Motor Unit, Endless Belts, ¼ h.p. Motor, 220/50 A.C., 3-4-jaw Chucks, Tailstock Chuck, Tools, as new, £35; 0-½" Sensitive Bench Drill (motorised), £8 10s.; Stuart No. 9 1½" × 1½", machined by Stuarts, and coal-fired V.M.T. Boiler with "Whitney" Donkey Pump, all fittings, £16; Stuart No. 7.V. 1" × 1", £4; Stuart No. 10 and V.C.F. coal-fired Boiler, all fittings, £10; 1½" Steam Roller (pictured in recent "M.E.") spirit fired, £20; 1" Portable Engine (spirit fired), driving saw bench, £12; Stuart Cirus Twin, 1" × 1", £5; 'L.B.S.C' Type Donkey Pump, 25s.—BURGESS, 15, Roseberry Avenue, High Wycombe.

Wanted, 3½" Drummond or Myford Lathe, in good condition; also MODEL ENGINEERS, Oct., 1943, to Dec., 1944. Particulars to—SANDS, 4, Hudleston Road, Liverpool 15.

Few No. 1 "Adept" Hand Shapers in stock, £5 10s. each, carriage extra; also all model engineers' tools. Send stamp for latest lists.—TERRY'S, Fishers Lane, Cold Ash, Newbury.

Exchange Large Clockmaker's Lathe, 20" bed, one 6" Universal head-spring Centre Pop, one heavy hollow Mandrel Head (dozen Collets), Adjustable Bearings, light Polishing Head, swinging Tool Holder, Hand Rest, for small S.C. Lathe.—12, Powis Villas, Brighton.

3" "Ideal" B.G.S.C. Bench Lathe, H.S. compound slide-rest, 4-tool turret, S.C. chuck, vertical slide, drill chuck, die-holder, change wheels, indexed lead-screws, perfect condition, nearest £25, buyer collects.—DAWSON, 70, Rawson Street, Farnworth, Lancs.

Wanted to Purchase, Boley, Wolf Jahn or Lorch 8-mm. Lathe. Please specify price and equipment with machine to—THE ACORN MACHINE TOOL CO. (1936) LTD., 610-614, Chiswick High Road, London, W.4.

Exchange, Complete small B.O. Welding and Brazing Torch, Tubes, Gauges, etc., and 620 Kodak Camera, 4.5 lens, Compur shutter, accessories, etc., for good Motor-driven Projector, 8 mm. or 9.5 or 16.—23, Sunnyside Road, Crosby, Liverpool 23.

3½" to 4" Lathe of good make required. Drummond, South Bend, or similar. Must be in good order.—EDDY, Chemist, Falmouth.

Two 3½" Myford Lathes, one 4" Tyzack, back geared, screw-cutting, complete with countershafts, ½ or 1/3 h.p. A.C. motors, Thermo push-button contactor starter switches, very good condition, may be seen—118, West Street, Marlow, Bucks.

7" Stroke Rhodes Toolroom Shaper for Sale, complete with 4" interchangeable slotting head. Ideal for the ambitious model maker, £68; also 7" Stroke Rhodes Shaper for disposal, requiring overhaul, pulley drive, but gearbox is available for conversion, £45. Apply—N. V. TOOLS, Queen's Road, Brentwood, Essex.

3" B.G. Adam's Lathe, Chuck and C/S., ¼ h.p. Motor, 2" Wade Plane; also 1" Micrometers, Dial Indicators, quantity of tools.—36 St. Mary's, Nuneaton.

For Sale, 6" Gap Bed B.G.S.C. Lathe, 3' 6" between centres, on strong stand, with treadle, faceplate, chucks, centres, change wheels, and cutting tools, complete, £35.—R. SMITH, "Malvern," Danygraig Road, Melyn, Neath, Glam.

4s. 9d. Any Lot. Five Lots, 22s. 6d.

One Doz. Twist Drills, Standard Jobbers, Mixed High Speed and Carbon, 1/16" to 3/16"; 18 Drills, 1/32" to 1/16"; 8 Drills, ¼" to ½"; 10 Carb. and Emery Wheels, 2" to 4" diameter, 1/16" to ¾" thick, ⅜" hole; ⅜" Square Shank Tool-holder with tool steel to make 12 turning tools; three high speed Tap or Reamer Fluting Cutters; 1¼" diameter; ⅜" hole; ⅛" to ½" thick; three high speed Slitting Saws, 1" diameter; ⅜" hole; three H.S. Clock Gear Type Cutters, ½" diameter, ⅜" hole; one Carb. Polishing Belt, 30 ft. long, 4" wide; 10 assorted Files, 4" to 6"; eight left-hand Taps to ½" diameter; six Fine Thread Taps, Instrument Thread, to ⅜" diameter. All brand new.—BURKE—Below.

2,000 Toolmakers Needle Files, assorted shapes, 9s. per doz.; 4s. 9d. half doz.—BURKE—Below.

5,000 Circular Split Dies, 13/16" diameter, cutting 0, 1, 2, 3, 4, 5, 6 B.A. threads, 8s. 9d. per set; Taps to suit seven sizes, 5s.; also Dies Cutting ⅛", 5/32", 3/16", 7/32", ¼", Whitworth, 6s. 3d. per set of five; Taps to suit, 3s. 9d. set; either tapers, seconds or plugs any thread.—BURKE—Below.

2,000 Small Taps, 7 to 12 B.A.; also 1/16", 3/32" Whit., 12s. doz.; 6s. 6d. half doz.—BURKE—Below.

3,000 Hexagon Die-Nuts, ¼", 5/16", ⅜", 7/16", ½", Whit., B.S.F., or American. S.A.E. Car Thread, 12s. 6d. set of five; three sets, 33s. 6d.; Taps to suit, 6s. set of five; three sets, 16s. 6d.—BURKE—Below.

4,000 High Speed Countersinks and Counterbores, with detachable pilots, diameter of cutters, ⅜" to ¾", brand new, best American make, Ex Aircraft Stores, actual value, 15s. to 25s. each. An absolute gift. Six assorted, £1; one doz., 37s. 6d.—BURKE—Below.

800 High Speed Radius and Angle Type forming Milling Cutters, 2½" to 4" diameter, 1" hole, brand new, given away, 14 lb. weight, assorted our selection, 70s.—BURKE—Below.

500 H.S. Angle and Straight Type End Mills, Reamers, Countersinks, ¼" to 1½" diameter, six assorted, 30s., our selection, all brand new. One cutter cost more.—BURKE—Below.

2,000 H.S. Reamers, End Mills, Solid Pilot Counterbores, brand new, ¼" to ¾" diameter, six assorted, our selection, 12s. 6d.; doz. assorted, 22s. 6d. —BURKE—Below.

600 Tungsten Carbide Tipped Tools, Shanks ⅜" square, also ½" by 1", worth 12s. to 20s. each, another gift, five assorted, £1, brand new.—BURKE—Below.

Prompt delivery, subject unsold. £1 orders post paid. Inspection at our Sheffield Warehouse by appointment.—J. BURKE, 41, Sunnyvale Road, Sheffield.

Wanted, Foot Motor to suit Myford ML4.—GLOVER, Audlem Road, Nantwich, Cheshire.

Copper Tube, ⅛", 5/32", 3/16", to ¾", 2", 2¼", 3", 3⅜", 3½", 4", 4¼", 5", 6", 6½", 6¾", 7" O.D., solid drawn; Silver Solder, 2s. 6d. stick; Flux, 2s. and 4s. tin; Rivets, Brazing Blowlamps, 5 pint 85s.; six pint, with flexible extension pipe, £6 5s. cash, or C.O.D.—CORBETT'S (LATHES), Stanton Hill, Mansfield. Tel. 583.

Wanted, 3"-5" Screwcutting Bench Lathe.—17, Upper Bevendean Avenue, Brighton.

Drummond 4" Lathe, stand, treadle, two S.C.C., also ¼ h.p. A.C. motor, starter, £25; 3½" Precision Lathe, oak trestle bench, countershaft chuck, slides, motor, tailstock partly finished, £20.—DAVIES, 79, Sussex Avenue Isleworth.

To Clear, Copper Tubes from 1/16" to .4½" diameter, copper sheets, frame steel, steel angle, brass ditto, iron and copper rivets, stainless steel rounds, boiler sets for "Ada," "Petrolea," "Molly," "P.V. Baker," "Bantam Cock," "Miss Ten-to-Eight." State requirements. S.A.E. No lists issued. Lowest prices yet in the trade. Clearing out to make way for new designs. Details later.—LINSTEAD, 69, Alexandra Road, Wimbledon, S.W.19.

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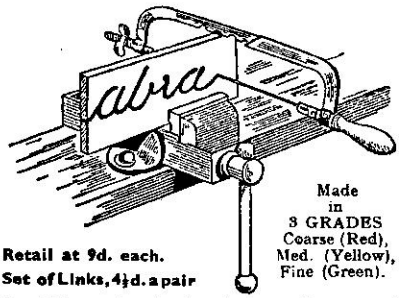

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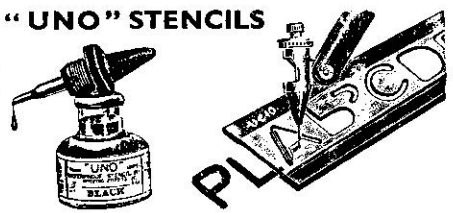

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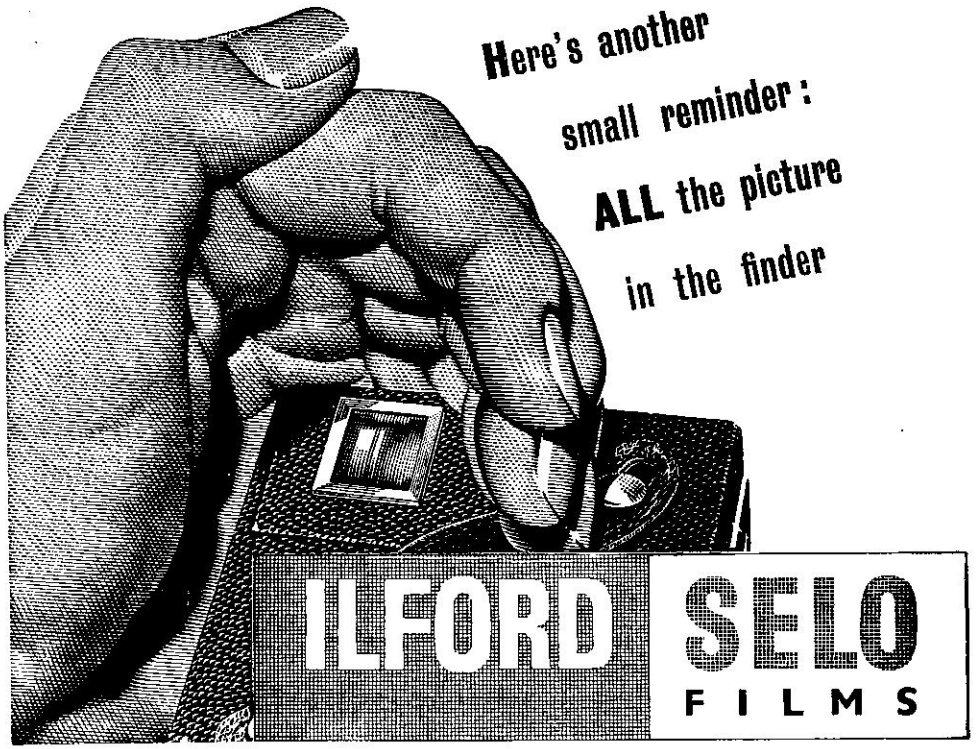

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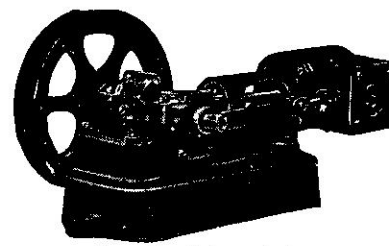

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